S. Hrg. 98-386

DEPARTMENT OF ENERGY FISCAL YEAR 1984 NATIONAL DEFENSE PROGRAMS AUTHORIZATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
STRATEGIC AND THEATER NUCLEAR FORCES

OF THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

FIRST SESSION

ON

S. 1106

TO AUTHORIZE APPROPRIATIONS FOR THE DEPARTMENT OF ENERGY FOR NATIONAL SECURITY PROGRAMS FOR FISCAL YEAR 1983, AND FOR OTHER PURPOSES

S. 1107

TO AUTHORIZE APPROPRIATIONS FOR THE DEPARTMENT OF ENERGY FOR NATIONAL SECURITY PROGRAMS FOR FISCAL YEAR 1984 AND FISCAL YEAR 1985, AND FOR OTHER PURPOSES

APRIL 12, 1983

Printed for the use of the Committee on Armed Services

24-451 O

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1983

S201-28

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DEPARTMENT OF ENERGY FISCAL YEAR 1984 NATIONAL DEFENSE PROGRAMS AUTHORIZATION

TUESDAY, APRIL 12, 1983

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

The subcommittee met in executive session, at 9:09 a.m., pursuant to notice, in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Members present: Senators Warner, Thurmond, Jackson, and Bingaman.

Staff present: Frank J. Gaffney, George K. Johnson, Jr., and James C. Smith, professional staff members; Willis D. Smith, deputy staff director and chief scientist for the minority; Marie Fabrizio Dickinson, staff assistant.

Also present: Hank Steenstra, assistant to Senator Quayle; Ed McGaffigan and Kathleen Callahan, assistants to Senator Bingaman; and Greg Pallas, assistant to Senator Exon.

[The bills S. 1106 and S. 1107 follow:]

[S. 1106, 98th Cong., 1st sess.]

A BILL To authorize appropriations for the Department of Energy for national security programs for fiscal year 1983, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1983".

TITLE I—NATIONAL SECURITY PROGRAMS

OPERATING EXPENSES

SEC. 101. Funds are authorized to be appropriated to the Department of Energy for fiscal year 1983 for operating expenses incurred in carrying out national security programs (including scientific research and development in support of the Armed Forces, strategic and critical materials necessary for the common defense, and military applications of nuclear energy and related management and support activities) as follows:

(1) For naval reactors development program, $331,760,000 including $9,660,000 for program management.

(2) For weapons activities, $2,765,491,000 to be allocated as follows:

(A) For research and development, $644,600,000.

(B) For weapons testing, $420,400,000.

(C) For the defense inertial confinement fusion program, $140,000,000, of which—

(i) $75,100,000 shall be used for glass laser experiments;

(ii) $41,800,000 shall be used for gas laser experiments;

(iii) $20,000,000 shall be used for pulsed power experiments; and

(iv) $3,100,000 shall be used for supporting research and experiments, except that none of such funds may be used for the research, development, or demonstration of the use of heavy ion devices as drivers for defense inertial confinement fusion experiments and defense inertial confinement fusion systems.

(D) For production and surveillance, $1,507,200,000.

(E) For weapons program management, $53,291,000.

(3) For verification and control technology, $52,400,000 including $1,800,000 for program management.

(4) For defense nuclear materials production, $969,100,000, to be allocated as follows:

(A) For uranium enriching, $109,000,000.

(B) For production reactor operations, $345,460,000.

(C) For processing of defense nuclear materials, $210,600,000.

(D) For special isotope separation research, $63,000,000.

(E) For supporting services, $227,040,000.

(F) For program management, $14,000,000.

(5) For defense nuclear waste, $288,929,000, to be allocated as follows:

(A) For interim waste management $190,313,000.

(B) For long term waste management technology, $53,861,000.

(C) For terminal waste storage, $14,000,000.

(D) For byproducts beneficial uses, $10,000,000.

(E) For decontamination and decommissioning, $12,655,000.

(F) For transportation research and development, $6,100,000.

(G) For program management, $2,000,000.

(6) For nuclear materials security and safeguards technology development program (defense programs), $43,160,000, including $5,850,000 for program management.

(7) For security investigations, $28,500,000.

PLANT AND CAPITAL EQUIPMENT

SEC. 102. Funds are authorized to be appropriated to the Department of Energy for fiscal year 1983 for plant and capital equipment (including planning, construction, acquisition, and modification of facilities, land acquisition related thereto, and acquisition and fabrication of capital equipment not related to construction) necessary for national security programs as follows—

(1) For naval reactors development:

Project 83-N-101, general plant projects, various locations, $1,500,000.

Project 83-N-102, additions to the radioactive materials laboratory, Knolls Atomic Power Laboratory, Schenectady, New York, $1,500,000.

Project 82-N-111, Materials Facility, Savannah River, South Carolina, $40,000,000, for a total project authorization of $55,000,000.

(2) For weapons activities:

Project 83-D-101, general plant projects, various locations, $15,800,000.

Project 83-D-122, Los Alamos Airport improvement, Los Alamos National Laboratory, New Mexico, $3,100,000.

Project 83-D-123, general plant projects, various locations, $16,300,000.

Project 83-D-124, standard missile-2 (SM-2) warhead production facilities, various locations, $2,000,000.

Project 82-D-106, weapons assembly facilities, Pantex Plant, Amarillo, Texas, $16,500,000 for a total project authorization of $40,000,000.

Project 82-D-107, utilities and equipment restoration, replacement, and upgrade, Phase III, various locations, $151,800,000, for a total project authorization of $239,300,000.

Project 82-D-108, nuclear weapons stockpile improvement, various locations, $33,300,000, for a total project authorization of $48,300,000.

Project 82-D-109, 155-millimeter artillery-fired atomic projectile (AFAP) production facilities, various locations, $30,000,000, for a total project authorization of $65,000,000.

Project 82-D-110, exhaust plenum modifications, Rocky Flats Plant, Colorado, $500,000, for a total project authorization of $12,500,000.

Project 82-D-111, interactive graphics system, various locations, $6,000,000, for a total project authorization of $15,000,000.

Project 82-D-144, simulation technology laboratory, Sandia National Laboratories, New Mexico, $10,000,000.

Project 82-D-146, weapons production and production support facilities, various locations, $40,000,000, for a total project authorization of $48,000,000.

Project 82-D-150, weapons material research and development facility, Lawrence Livermore National Laboratory, California, $5,000,000.

Project 82-D-152, new detonator facility, Los Alamos National Laboratory, New Mexico, $9,100,000.

Project 82-D-153, tritium facility, Los Alamos National Laboratory, New Mexico, $2,600,000.

Project 81-D-115, MX warhead production facilities, various locations, $55,000,000, for a total project authorization of $95,000,000.

Project 81-D-133, earthquake damage restoration, Lawrence Livermore National Laboratory, Livermore, California, $1,500,000, for a total project authorization of $5,500,000.

Project 81-D-134, earthquake damage restoration, Sandia National Laboratories, Livermore, California, $1,700,000, for a total project authorization of $3,700,000.

Project 79-7-c, proton storage ring, Los Alamos National Laboratory, Los Alamos, New Mexico, $2,800,000, for a total project authorization of $21,800,000.

Project 78-17-d, steam plant improvements, Y-12 Plant, Oak Ridge, Tennessee, $1,500,000, for a total project authorization of $27,000,000.

(3) For materials production:

Project 83-D-135, general plant projects, various locations, $26,000,000.

Project 83-D-136, plant engineering and design, various locations, $2,000,000.

Project 83-D-138, PUREX canyon and dissolver filter systems improvements, Richland, Washington, $4,250,000.

Project 83-D-142, fuel dissolver off-gas transfer and treatment system, Idaho Fuels Processing Facility, Idaho National Engineering Laboratory, Idaho, $7,600,000.

Project 83-D-146, water pollution control, Feed Materials Production Facility, Fernald, Ohio, $2,500,000.

Project 83-D-147, pollution discharge elimination, Savannah River, South Carolina, $1,000,000.

Project 83-D-148, nonradioactive hazardous waste management, Savannah River, South Carolina, $1,000,000.

Project 83-D-180, facility storage modifications, various locations, $16,300,000.

Project 82-D-124, restoration of production capabilities, Phases II and III, various locations, $48,500,000, for a total project authorization of $174,500,000.

Project 82-D-126, reactor safety and reliability, various locations, $2,000,000, for a total project authorization of $44,900,000.

Project 82-D-136, fuel processing facilities upgrade, Idaho Fuels Processing Facility, Idaho National Engineering Laboratory, Idaho, $6,000,000, for a total project authorization of $46,000,000.

Project 82-D-201, special plutonium recovery facilities, F-chemical separations area, Savannah River, South Carolina, $37,000,000, for a total project authorization of $39,000,000.

Project 81-D-142, steam transfer header, Savannah River, South Carolina, $10,400,000, for a total project authorization of $18,400,000.

Project 81-D-143, L-reactor upgrade, Savannah River, South Carolina, $19,000,000, for a total project authorization of $134,000,000.

(4) For defense nuclear waste:

Project 83-D-156, general plant projects, interim waste operations, various locations, $19,145,000.

Project 83-D-157, additional radioactive waste storage facilities, Richland, Washington, $19,000,000.

Project 83-D-159, general plant projects, long-term waste management technology, Savannah River, South Carolina, $500,000.

Project 82-BU-1, byproducts beneficial uses demonstration plants, various locations, $10,000,000.

Project 81-T-104, radioactive waste facilities improvements, Oak Ridge National Laboratory, Tennessee, $1,000,000, for a total project authorization of $21,000,000.

Project 81-T-105, defense waste processing facility, Savannah River, South Carolina, $40,000,000, for a total project authorization of $70,000,000.

Project 77-13-f, waste isolation pilot plant, Delaware Basin, Southeast, New Mexico, $110,800,000, for a total project authorization of $268,400,000.

(5) For nuclear materials security and safeguards development:

Project 83-D-175, general plant project, New Brunswick Laboratory, $500,000.

(6) For capital equipment not related to construction—

(A) for naval reactors development, $11,000,000;

(B) for weapons activities, $196,000,000;

(C) for verification and control technology, $1,500,000;

(D) for materials production, $107,700,000;

(E) for defense nuclear waste, $31,646,000; and

(F) for nuclear materials security and safeguards development, $3,700,000.

TITLE II—GENERAL PROVISIONS

REPROGRAMING

Sec. 201. (a) Except as otherwise provided in this Act—

(1) no amount appropriated pursuant to this Act may be used for any program in excess of 105 per centum of the amount authorized for that program by this Act or $10,000,000 more than the amount authorized for that program by this Act, whichever is the lesser, and

(2) no amount appropriated pursuant to this Act may be used for any program which has not been presented to, or requested of, the Congress,

unless a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) has passed after receipt by the appropriate committees of Congress of notice from the Secretary of Energy (hereinafter in this title referred to as the "Secretary") containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of such proposed action, or unless each such committee before the expiration of such period has transmitted to the Secretary written notice to the effect that such committee has no objection to the proposed action.

(b) In no event may the total amount of funds obligated pursuant to this Act exceed the total amount authorized to be appropriated by this Act.

LIMITS ON GENERAL PLANT PROJECTS

Sec. 202. (a) The Secretary may carry out any construction project under the general plant projects provisions authorized by this Act if the total estimated costs of the construction project does not exceed $1,000,000.

(b) If at any time during the construction of any general plant project authorized by this Act, the estimated cost of the project is revised because of unforeseen cost variations and the revised cost of the project exceeds $1,000,000, the Secretary shall immediately furnish a complete report to the appropriate committees of Congress explaining the reasons for the cost variation.

(c) In no event may the total amount of funds obligated to carry out all general plant projects authorized by this Act exceed the total amount authorized to be appropriated for such projects by this Act.

LIMITS ON CONSTRUCTION PROJECTS

Sec. 203. (a) Whenever the current estimated cost of a construction project which is authorized by section 102 of this Act, or which is in support of national security programs of the Department of Energy and was authorized by any previous Act, exceeds by more than 25 per centum the higher of (1) the amount authorized for the project, or (2) the amount of the total estimated cost for the project as shown in the most recent budget justification data submitted to Congress, construction may not be started or additional obligations incurred in connection with the project above the total estimated cost, as the case may be, unless a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three days to a day certain) has passed after receipt by the appropriate committees of the Congress of written notice from the Secretary containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of the action, or unless each committee before the expiration of such period has notified the Secretary it has no objection to the proposed action.

(b) Subsection (a) shall not apply to any construction project which has a current estimated cost of less than $5,000,000.

FUND TRANSFER AUTHORITY

SEC. 204. To the extent specified in appropriation Acts, funds appropriated pursuant to this Act may be transferred to other agencies of the Government for the performance of the work for which the funds were appropriated, and funds so transferred may be merged with the appropriations of the agency to which the funds are transferred.

AUTHORITY FOR CONSTRUCTION DESIGN

SEC. 205. (a)(1) Within the amounts authorized by this Act for plant engineering and design, the Secretary may carry out advance planning and construction designs (including architectural and engineering services) in connection with any proposed construction project if the total estimated cost for such planning and design does not exceed $2,000,000.

(2) In any case in which the total estimated cost for such planning and design exceeds $300,000, the Secretary shall notify the appropriate committees of Congress in writing of the details of such project at least thirty days before any funds are obligated for design services for such project.

(b) In any case in which the total estimated cost for advance planning and construction design in connection with any construction project exceeds $2,000,000, funds for such design must be specifically authorized by law.

AUTHORITY FOR EMERGENCY CONSTRUCTION DESIGN

SEC. 206. In addition to the advance planning and construction design authorized by section 102, the Secretary may perform planning and design utilizing available funds for any Department of Energy defense activity construction project whenever the Secretary determines that the design must proceed expeditiously in order to meet the needs of national defense or to protect property or human life.

FUNDS AVAILABLE FOR ALL NATIONAL SECURITY PROGRAMS OF THE DEPARTMENT OF ENERGY

SEC. 207. Subject to the provisions of appropriation Acts, amounts appropriated pursuant to this Act for management and support activities and for general plant projects are available for use, when necessary, in connection with all national security programs of the Department of Energy.

ADJUSTMENTS FOR PAY INCREASES

SEC. 208. Appropriations authorized by this Act for salary, pay, retirement, or other benefits for Federal employees may be increased by such amounts as may be necessary for increases in such benefits authorized by law.

AVAILABILITY OF FUNDS

SEC. 209. When so specified in an appropriation Act, amounts appropriated for "Operating Expenses" or for "Plant and Capital Equipment" may remain available until expended.

[S. 1107, 98th Cong., 1st sess.]

A BILL To authorize appropriations for the Department of Energy for national security programs for fiscal year 1984 and fiscal year 1985, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Security Programs Authorization Act for Fiscal Years 1984 and 1985".

TITLE I—NATIONAL SECURITY PROGRAMS

OPERATING EXPENSES

SEC. 101. Funds are authorized to be appropriated to the Department of Energy for fiscal year 1984 for operating expenses incurred in carrying out national security programs (including scientific research and development in support of the Armed Forces, strategic and critical materials necessary for the common defense, and military applications of nuclear energy and related management and support activities) as follows:

(1) For naval reactors development, $490,000,000.
(2) For weapons activities, $3,153,125,000.
(3) For verification and control technology, $59,900,000.
(4) For materials production, $1,125,700,000.
(5) For defense waste and byproducts management, $318,900,000.
(6) For nuclear safeguards and security, $48,000,000.
(7) For security investigations, $29,500,000.

PLANT AND CAPITAL EQUIPMENT

SEC. 102. Funds are authorized to be appropriated to the Department of Energy for fiscal year 1984 for plant and capital equipment (including planning, construction, acquisition, and modification of facilities, land acquisition related thereto, and acquisition and fabrication of capital equipment not related to construction) necessary for national security programs as follows:

(1) For naval reactors development:

Project 84-N-101, general plant projects, various locations, $2,500,000.

Project 83-N-102, addition to the radioactive materials laboratory, Knolls Atomic Power Laboratory, Schenectady, New York, $6,500,000, for a total project authorization of $8,000,000.

Project 82-N-111, materials facility, Savannah River, South Carolina, $70,000,000, for a total project authorization of $125,000,000.

Project 81-T-112, modifications and additions to prototype facilities, various locations, $1,000,000, for a total authorization of $104,000,000.

(2) For weapons activities:

Project 84-D-101, general plant projects, various locations, $27,100,000.

Project 84-D-111, general plant projects, various locations, $29,500,000.

Project 84-D-103, hardened central guard force facility, Los Alamos National Laboratory, Los Alamos, New Mexico, $600,000.

Project 84-D-104, nuclear materials storage facility, Los Alamos National Laboratory, Los Alamos, New Mexico, $700,000.

Project 84-D-107, nuclear testing facilities revitalization, various locations, $38,500,000.

Project 84-D-112, TRIDENT II warhead production facilities, various locations, $19,300,000.

Project 84-D-113, antisubmarine warfare/standoff weapon warhead production facilities, various locations, $17,600,000.

Project 84-D-114, consolidated manufacturing facility, Rocky Flats Plant, Golden, Colorado, $24,100,000.

Project 84-D-115, electrical system expansion, Pantex Plant, Amarillo, Texas, $1,500,000.

Project 84-D-117, inert assembly and test facility, Pantex Plant, Amarillo, Texas, $1,500,000.

Project 84-D-118, high-explosive subassembly facility, Pantex Plant, Amarillo, Texas, $7,000,000.

Project 84-D-119, railroad track replacement and upgrade, Pantex Plant, Amarillo, Texas, $800,000.

Project 84-D-120, explosive component test facility, Mound Facility, Miamisburg, Ohio, $13,100,000.

Project 84-D-121, safeguards and site security upgrading, Rocky Flats Plant, Golden, Colorado, $10,000,000.

Project 83-D-124, standard missile-2 (SM-2) warhead production facilities, various locations, $3,000,000, for a total authorization of $5,000,000.

Project 83-D-134, SENTRY warhead production facilities, various locations, $16,300,000.

Project 82-D-107, utilities and equipment restoration, replacement, and upgrade, Phase III, various locations, $229,200,000, for a total project authorization of $449,600,000.

Project 82-D-108, nuclear weapons stockpile improvement, various locations, $4,000,000, for a total project authorization of $46,800,000.

Project 82-D-111, interactive graphics systems, various locations, $15,600,000, for a total project authorization of $24,600,000.

Project 82-D-144, simulation technology laboratory, Sandia National Laboratories, Albuquerque, New Mexico, $8,000,000, for a total project authorization of $12,200,000.

Project 82-D-146, weapons production and production support facilities, various locations, $14,200,000, for a total project authorization of $62,200,000.

Project 82-D-150, weapons materials research and development facility, Lawrence Livermore National Laboratory, Livermore, California, $2,900,000, for a total project authorization of $10,400,000.

Project 81-D-101, particle beam fusion accelerator-II, Sandia National Laboratories, Albuquerque, New Mexico, $5,400,000, for a total project authorization of $42,150,000.

Project 81-D-115, Missile X warhead production facilities, various locations, $30,000,000, for a total project authorization of $104,100,000.

(3) For materials production:

Project 84-D-125, general plant projects, various locations, $31,000,000.

Project 84-D-126, plant engineering and design, various locations, $2,000,000.

Project 84-D-130, modification processing facility substations, Savannah River, South Carolina, $5,600,000.

Project 83-D-138, PUREX filter systems improvements, Richland, Washington, $8,500,000, for a total project authorization of $12,750,000.

Project 83-D-142, fuel dissolver off-gas transfer and treatment system, Idaho Fuels Processing Facility, Idaho National Engineering Laboratory, Idaho, $4,100,000, for a total project authorization of $7,600,000.

Project 83-D-146, water pollution control, Feed Materials Production Center, Fernald, Ohio, $4,000,000, for a total project authorization of $5,400,000.

Project 83-D-147, pollution discharge elimination, Savannah River, South Carolina, $2,000,000, for a total project authorization of $3,000,000.

Project 83-D-148, nonradioactive hazardous waste management, Savannah River, South Carolina, $3,000,000, for a total project authorization of $4,000,000.

Project 83-D-180, facility storage modifications, various locations, $6,500,000, for a total project authorization of $15,800,000.

Project 82-D-118, N plant security and surveillance, Richland, Washington, $400,000, for a total project authorization of $4,400,000.

Project 82-D-124, restoration of production capabilities, Phases II, III, and IV, various locations, $118,600,000, for a total project authorization of $253,300,000.

Project 82-D-136, fuel processing facilities upgrade, Idaho Fuels Processing Facility, Idaho National Engineering Laboratory, Idaho, $6,000,000, for a total project authorization of $46,000,000.

Project 82-D-201, special plutonium recovery facilities, JB-Line, Savannah River, South Carolina, $26,000,000, for a total project authorization of $37,000,000.

Project 81-D-142, steam transfer header, Savannah River, South Carolina, $7,400,000, for a total project authorization of $18,400,000.

(4) For defense waste and byproducts management:

Project 84-D-150, general plant projects, interim waste operations and long-term waste management technology, various locations, $25,830,000.

Project 83-D-157, additional radioactive waste storage facilities, Richland, Washington, $31,000,000, for a total project authorization of $50,000,000.

Project 81-T-104, radioactive waste facilities improvements, Oak Ridge National Laboratory, Tennessee, $1,000,000 for a total project authorization of $21,000,000.

Project 81-T-105, defense waste processing facility, Savannah River, South Carolina, $142,000,000, for a total project authorization of $212,000,000.

Project 77-13-f, waste isolation pilot plant, Delaware Basin, Southeast, New Mexico, $109,700,000, for a total project authorization of $343,500,000.

(5) For capital equipment not related to construction—

(A) for naval reactors development, $20,000,000;
(B) for weapons activities, $234,600,000;
(C) for verification and control technology, $1,750,000;
(D) for materials production, $102,500,000;
(E) for defense waste and byproducts management, $33,900,000; and
(F) for nuclear safeguards and security, $4,000,000.

TITLE II—GENERAL PROVISIONS

REPROGRAMING

SEC. 201. Except as otherwise provided in this Act—

(1) no amount appropriated pursuant to this Act may be used for any program in excess of 105 per centum of the amount authorized for that program by this Act or $10,000,000 more than the amount authorized for that program by this Act, whichever is the lesser, and

(2) no amount appropriated pursuant to this Act may be used for any program which has not been presented to, or requested of, the Congress, unless a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) has passed after receipt by the appropriate committees of Congress of notice from the Secretary of the Department of Energy (hereinafter in this title referred to as the "Secretary") containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of the proposed action, or unless each committee before the expiration of the period has transmitted to the Secretary written notice to the effect that the committee has no objection to the proposed action.

LIMITS ON GENERAL PLANT PROJECTS

SEC. 202. (a) The Secretary may carry out any construction project under the general plant projects provisions authorized by this Act if the total estimated cost of the construction project does not exceed $1,200,000.

(b) If at any time during the construction of any general plant project authorized by this Act, the estimated cost of the project is revised because of unforeseen cost variations and the revised cost of the project exceeds $1,200,000, the Secretary shall immediately furnish a complete report to the appropriate committees of Congress explaining the reasons for the cost variation.

LIMITS ON CONSTRUCTION PROJECTS

SEC. 203. (a) Whenever the current estimated cost of a construction project which is authorized by section 102 of this Act, or which is in support of national security programs of the Department of Energy and was authorized by any previous Act, exceeds by more than 25 per centum the higher of (1) the amount authorized for the project, or (2) the amount of the total estimated cost for the project as shown in the most recent budget justification data submitted to Congress, construction may not be started or additional obligations incurred in connection with the project above the total estimated cost, as the case may be, unless a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three days to a day certain) has passed after receipt by the appropriate committees of the Congress of written notice from the Secretary containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of the action, or unless each committee before the expiration of the period has notified the Secretary it has no objection to the proposed action.

(b) Subsection (a) shall not apply to any construction project which has a current estimated cost of less than $5,000,000.

FUND TRANSFER AUTHORITY

SEC. 204. To the extent specified in appropriation Acts, funds appropriated pursuant to this Act may be transferred to other agencies of the Government for the performance of the work for which the funds were appropriated, and funds so transferred may be merged with the appropriations of the agency to which the funds are transferred.

AUTHORITY FOR CONSTRUCTION DESIGN

SEC. 205. (a) Within the amounts authorized by this Act for plant engineering and design, the Secretary may carry out advance planning and construction designs (including architectural and engineering services) in connection with any proposed construction project.

(b) In any case in which the total estimated cost for such planning and design exceeds $1,000,000, the Secretary shall notify the appropriate committees of Congress in writing of the details of the project at least thirty days before any funds are obligated for design services for the project.

AUTHORITY FOR EMERGENCY CONSTRUCTION DESIGN

SEC. 206. In addition to the advance planning and construction design authorized by section 102, the Secretary may perform planning and design utilizing available funds for any Department of Energy national security program construction project whenever the Secretary determines that the design must proceed expeditiously in order to meet the needs of national defense or to protect property or human life.

FUNDS AVAILABLE FOR ALL NATIONAL SECURITY PROGRAMS OF THE DEPARTMENT OF ENERGY

SEC. 207. Subject to the provisions of appropriation Acts, amounts appropriated pursuant to this Act for management and support activities and for general plant projects are available for use, when necessary, in connection with all national security programs of the Department of Energy.

ADJUSTMENTS FOR PAY INCREASES

SEC. 208. Appropriations authorized by this Act for salary, pay, retirement, or other benefits for Federal employees may be increased by such amounts as may be necessary for increases in benefits authorized by law.

AVAILABILITY OF FUNDS

SEC. 209. When so specified in an appropriation Act, amounts appropriated for "Operating Expenses" or for "Plant and Capital Equipment" may remain available until expended.

TITLE III—AUTHORIZATION OF APPROPRIATIONS

FOR FISCAL YEAR 1985

SEC. 301. There are authorized to be appropriated to the Department of Energy to be available not earlier than October 1, 1984, such sums as may be necessary for fiscal year 1985 for programs set forth in this Act.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. Good morning. This morning we will hear testimony from officials of the Department of Energy and the Department of Defense on the national defense programs managed by the Department of Energy. These programs involve primarily the production of nuclear weapons that are the heart of our strategic deterrent and the application of nuclear power for U.S. naval vessels.

The fiscal year 1984 budget for these programs total some $6.7 billion which is nearly two-thirds of the budget of the entire Energy Department. The budget request for fiscal year 1984 is $1 billion more than the amount appropriated for fiscal year 1983—an increase of 17 percent. Assuming inflation of 5 percent, this translates to real growth of 12 percent in these programs which can be compared to 10 percent real growth requested by the President in the Defense Department's budget.

In view of the Senate Budget Committee's recent action to hold the Defense function to 5 percent real growth, I expect there will be substantial pressure to scrutinize this budget closely and we may have to make some difficult decisions as we review this budget.

I would also remind my colleagues that we were unable to enact an authorization bill for these programs for fiscal year 1983. The Senate leadership, after consulting with the administration, chose not to pursue Senate floor action on the Deparment of Energy bill reported out last year by the Armed Services Committees. It is my intention to incorporate fiscal year 1983 authorization into the fiscal year 1984 bill. Toward that end, Senator Jackson and I will introduce the fiscal year 1983 authorization bill, as well as the fiscal year 1984 authorization bill.

I would also advise my colleagues that Chairman Tower is considering combining the defense procurement authorization bill, the military construction authorization bill, and this DOE defense programs authorization bill into a single national defense authorization bill to expedite the handling of these bills and to preclude the type of problem that developed last year in getting Senate consideration of the Department of Defense authorization bill.

Our agenda this morning is full. Our first panel will present the Department of Energy defense programs budget—less naval nuclear power—the second panel of laboratory directors will highlight evolving strategic issues, and I look forward to getting their comments on the President's recent call for an accelerated strategic defense effort, and finally, we will hear from Admiral McKee on his naval nuclear power program.

Mr. Wade, it is good to see you again. Dr. Wagner, welcome back.

Senator Jackson, would you care to comment?

Senator **Jackson**. Mr. Chairman, I appreciate your courtesy. I am scheduled this morning for three meetings going on at once. If it is not out of order, I will ask that my questions appear after the gentlemen have had an opportunity to put their statements in the record or make their formal statements.

Senator **Warner**. Senator Thurmond?

Senator **Thurmond**. Mr. Chairman, I do not have an opening statement, but I want to say that in spite of all the controversy about nuclear power, in my judgment we have to go forward with it. It is the cleanest, cheapest form of energy. I hope the Energy Department will not be discouraged and thwarted in their efforts to do what they ought to do.

L REACTOR

I might ask about the situation with regard to the L reactor at Savannah River now. What is the status at this time?

STATEMENT OF HON. TROY WADE, PRINCIPAL DEPUTY ASSISTANT SECRETARY OF ENERGY FOR DEFENSE PROGRAMS

Mr. **Wade**. Senator, as you will recall, the Department responded favorably to your request to hold additional hearings in South Carolina and Georgia. We are waiting for the arrival of the record of the hearing that you conducted in Augusta. As soon as that is in hand we will schedule hearings in South Carolina and Georgia and the record of those hearings will become part of the record of your hearing in Augusta. In that fashion I believe we will be able to have for the public record all the comments and concerns of all the citizens of those two States. I believe we can do that successfully and we still believe we will be able to restart the reactor in October of this year.

Senator **THURMOND**. What is the status of the suit that was brought by the attorney general in South Carolina? Has that been dismissed?

Mr. **WADE**. It has not. The suit is still pending. As a matter of fact, we are continuing to answer interrogatories, so there has been no court date set. We have been in active negotiation with the State of South Carolina, and we are hopeful that within the next week or so we will find some resolution that will satisfy the State.

TRACES OF TOXIC CHEMICALS

Senator **THURMOND**. We heard a few years ago about burying poisonous material from the plant. Are you familiar with that?

Mr. **WADE**. Yes, sir, I am, Senator Thurmond.

Senator **THURMOND**. Will you tell us about that?

Mr. **WADE**. In sample wells that are on the reservation, traces of two toxic chemicals, triclene and perclene, were detected. This was not the first time that these toxic chemicals have been detected. The concern is that these chemicals are in a sample well that intersects with the Tuscaloosa aquifer. The levels are exceedingly low. The fact that the toxic chemicals exist at all is of concern to us. It is no health hazard on the plant, nor is it a health hazard off the plant. We are dealing with the State with regard to how to resolve the problem overall. I believe we have it under control and it is not a health hazard.

Senator **THURMOND**. It is not now a health hazard and you don't think it will become a health hazard?

Mr. **WADE**. That is correct.

BARNWELL REPROCESSING PLANT

Senator **THURMOND**. The committee has been advised that the owners of the reprocessing plant are willing to transfer that facility to the Federal Government at no cost. If this is accurate, what will be your position on accepting the plant? That plant must have cost $300 or $400 million.

Mr. **WADE**. I believe it cost a little more than that, Senator. I am not sure of the exact cost. The Department is currently reviewing potential uses for Barnwell. It would probably be the nuclear energy part of the Department of Energy, the civilian nuclear power part, rather than our part, the defense program, that would use the facility. It is under active internal review. To my knowledge there has been no decision made one way or the other.

Senator **THURMOND**. It was hoped that they would be able to get some private concern to operate it, but that has not been worked out. The owners are willing to give it to the Government, as I understand it; is that right?

Mr. **WADE**. That is correct, yes, sir.

Senator **Thurmond**. What is the position of the Department of Energy? Is there any possible use that the Federal Government could make of this facility?

Mr. **Wade**. It could conceivably be used to process civilian sector fuel. Even though the proposal says that the facility will be transferred to the Federal Government, it is still proposed that it be operated by a contractor, not by the Government. So potential uses for the civilian sector are being reviewed.

Senator **Thurmond**. Would you like it expand your remarks on any of the subjects we covered?

Mr. **Wade**. Not at this time, Senator.

Senator **Thurmond**. Thank you very much. Thank you, Mr. Chairman.

Senator **Warner**. Senator Jackson?

Senator **Jackson**. Thank you, Mr. Chairman.

Mr. Wade, I have three or four questions and then I will leave the rest for the record.

NEW PRODUCTION REACTOR

What is your conclusion as to the need for a new production reactor?

Mr. **Wade**. I believe that the Department has concluded, and that conclusion has been corroborated by several independent studies, that there is indeed a need for a new reactor that would come on line in the midnineties to principally manufacture tritium.

Senator **Jackson**. And the tritium requirement of course is an ongoing one with a half-life of 12 years?

Mr. **Wade**. That is correct. As long as there are nuclear weapons in the stockpile, there will be a continuing need for tritium.

Senator **Jackson**. Some people say that by restarting the shutdown reactors, all of the defense production requirements can be met. Do you agree with that? That is, by restarting the old reactors.

Mr. **Wade**. We are restarting the one final mothballed reactor the only one that is available to us, Senator Jackson, the L reactor at Savannah River. The other reactor that is there is beyond repair. It has been deemed nonrestartable. The concern of course is that as we move into the next century, those reactors at Savannah River and the N reactor are becoming very old, and with the continuing need for tritium, it just seems prudent to have a new reactor as we move into the next decade and the next century.

Senator **Jackson**. How much money is in the fiscal year 1984 budget for the conceptual design work on a new production reactor and how much did you as an official in the Government request, if you recall? How much is in there now and what was your initial request?

Mr. **Wade**. There was $5 million in the fiscal year 1984 budget request for preliminary design. I believe the first department request was $25 million internal to the Department. It was reduced in the OMB pending secretarial decision about type of reactor and location of reactor.

Senator **Jackson**. What is the cheapest way in terms of initial capital outlay to obtain the required extra production capacity once the current N reactor is retired? And how much would this alternative cost be?

Mr. WADE. Senator Jackson, the proposed new production reactor is to manufacture tritium. The N reactor is a plutonium producing reactor. So you can't really compare the two straight across the board. We will continue to operate the reactors, the N reactor, but also the Savannah River reactors as long as it is safe to do so, to maintain our production capability.

SPECIAL ISOTOPE SEPARATION

Senator JACKSON. I have one other question, Mr. Chairman, and then I will submit questions for the record. I appreciate Mr. Wade's going out of order.

As you know, there is discussion of the conception of a special isotope separation facility to purify the Department's plutonium for weapon use. What is the current analysis of which process is preferred? One, for use in the processing, and when will a decision be made on starting the construction? What is the current thinking on sites for this facility, if you have reached that point?

Mr. WADE. Senator Jackson, there are of course two technologies at issue here, one that has been developed by the Lawrence Livermore Laboratory, the atomic vapor process, and the molecular process that has been developed by Los Alamos. Currently under review by the Secretary of Energy is a recommendation that has been made by the Assistant Secretary for Defense Programs that would identify one of those technologies as the first production technology and identify the location for that production plant. Also part of the recommendation that has been made to the Secretary of Energy is to carry both processes through prototypes. They are high technology processes, and there are those that feel that in order to assure that we have that technology in the time that we need it [deleted] we need to carry both for a while. The decisions on the part of the Secretary of Energy we would hope would be forthcoming within the next week or so.

Senator JACKSON. Very shortly, in other words?

Mr. WADE. I hope so, yes, sir.

Senator JACKSON. Thank you, Mr. Chairman, I will submit my other questions.

Senator WARNER. Senator Thurmond, have you any further questions?

Senator THURMOND. No, thank you, Mr. Chairman.

Senator WARNER. I will ask Dr. Wagner who has a commitment before the House of Representatives to lead off.

I understand, Mr. Wade, you agree to having Dr. Wagner proceed.

STATEMENT OF DR. RICHARD L. WAGNER, ASSISTANT TO THE SECRETARY OF DEFENSE (ATOMIC ENERGY) ON NUCLEAR WEAPONS PROGRAMS

Dr. WAGNER. Thank you, Mr. Chairman. I am sorry that I do have this conflict. I should leave in 20 minutes. I will try to compress what I had planned to say in about 15 minutes and leave some room for questions, if there are any.

I have a prepared statement for the record, which I would like to submit and then paraphrase that in my comments.

I am here this morning to discuss and lay out for you the Department of Defense's views on the Department of Energy program, in particular why it is that we need what I might term the product that the Department of Defense obtains from the Department of Energy. Those products are two basic kinds. The first is the familiar production of nuclear weapons for the stockpile according to the mutually agreed to acquisition process.

The second kind of product is often not thought of as a product, but over the long term to DOD it is equally important. And that is ideas for advanced designs of nuclear weapons that we could use to strengthen our deterrent position in the next decade or in the next century. Those two kinds of products are over the long term of equal importance to us in the DOD. It is that equality of importance that I want to stress here.

It is often tempting, I think, in times when the money is tight, as we all know it to be this year, to cut back on research aspects of the program in favor of producing current weapons for stockpile. We really must see both activities carried out at an appropriate level.

Senator **Warner**. At this point you are suggesting there are not adequate funds in this budget? Or are you suggesting that Members of Congress try to hold what you have in the budget?

Dr. **Wagner**. I believe there are adequate funds in the administration's budget request, but they are very tight. I would find it hard to know how to accommodate a reduction in funds below the current budget on either the stockpile production or on the somewhat less concrete research and development for the future.

What I would like to do is take 5 minutes each on the production and on the research and development side and lay out some of the fundamental considerations on both of those. I have a few graphs. I would like to show the first one.

[Chart deleted.]

This is a chart that displays for you the numbers of weapons in the stockpile since about 1960. It displays the start times, the initial operational capability time for all the systems that are currently in the stockpile, and ones which we plan to bring into the stockpile out into the future. They are divided into three parts: The top row of triangles, the strategic offensive systems, then the tactical systems, and the fleet strategic defensive systems.

Circled in red are systems in production during the current fiscal year, fiscal 1984. I will address those systems and the need for them in just a minute.

As you can see, the stockpile is right now at about the lowest level that it has been since the early sixties. What we are embarked on here is a modernization program to bring new systems into the stockpile, having characteristics more appropriate to defense and for which the warheads themselves are matched better to those systems than they have been in the past. You will see that this modernization program also includes a modest increase in the numbers of the weapons, but the fundamental characteristic of it is that it is a modernization, not a large numerical buildup.

LONG RANGE INTERMEDIATE NUCLEAR FORCES

Ground launched cruise missile—W-84: [Deleted.]
Pershing II W-85: [Deleted.]

Absolutely essential to integrity of NATO Alliance: Counter to Soviet SS-20, other missiles; supports NATO 1979 decision; and motivate Soviets to reduce SS-20's, other missiles.

B-61 bomb—in production: Much improved operations, safety, security.

The next chart addresses perhaps the most important of the near term production starts, weapons for the intermediate nuclear forces, the GLCM and Pershing II. Both of them will start production this year and carry on for the next several years. Those two systems are absolutely essential to the integrity of the NATO Alliance. If something were to happen to cause those systems to slip or even after the IOCs have come to pass to reduce the numbers, I believe that it would seriously jeopardize both the political cohesion and the military capability of the NATO Alliance.

SHORT RANGE NONSTRATEGIC NUCLEAR FORCES

Pose severe operational problems for Soviet Theater Commander.
[Deleted.]

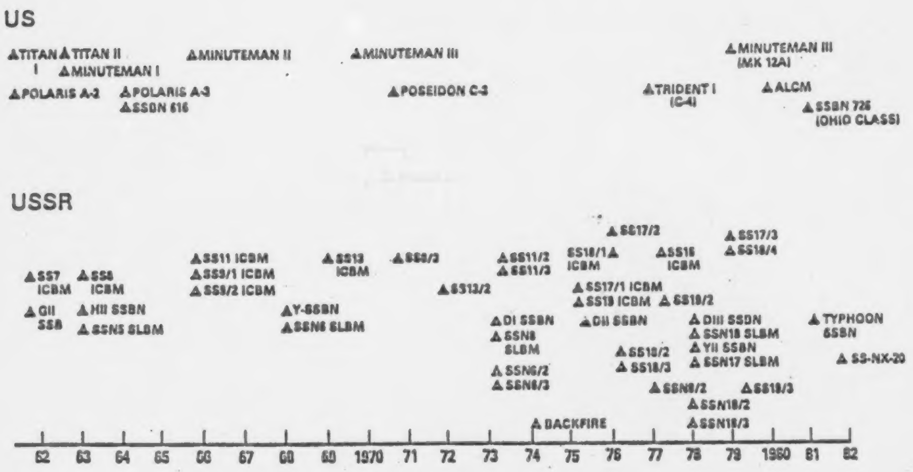
Lance missile—W-70, production completed in fiscal year 1983.
8-inch artillery projectile—W-79 in production.
155mm artillery projectile—W-82. [Deleted.]

The next chart addresses the other part of the NATO nuclear capability, the short range forces. These forces are sometimes thought of as being not particularly useful. However, they are also in need of substantial improvement through modernization and as we are beginning to understand how the Soviets view the theater force relationship, we see that they attach great importance to the short-range forces.

Having those short range forces, modern ones, in the field poses very severe operational problems for the Soviet theater commander. These forces are, in fact, generally accepted by the allies today, and during the next few months, NATO will be working out a position toward the modernization of the short range forces in addition to the GLCM and Pershing intermediate range systems.

The early indications for that modernization program are that NATO will in fact endorse a rather substantial modernization program for the short range forces which in the Department of Energy budget consists of the current production of the Lance missile, the 8-inch artillery shell, and, a few years from now, of particular importance we believe, the 155-millimeter nuclear artillery projectile.

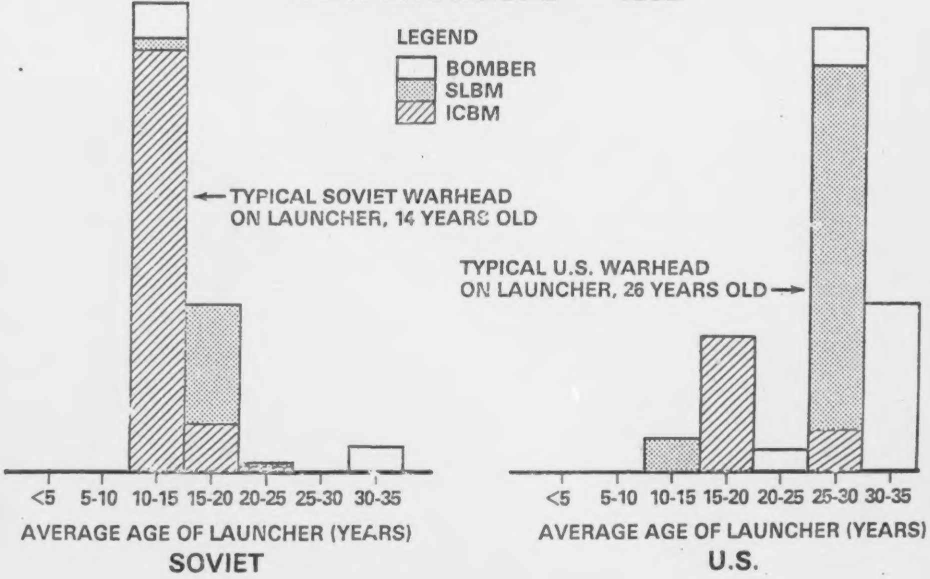
I should like to skip the next chart, if I may, and go on to the one after that, which addresses the modernization nature of our program.



INTRODUCTION OF SELECTED SYSTEMS BY YEAR

You have seen this chart before in a different context. It shows the Soviet systems which have been introduced into the inventory and the United States systems. You can see that the Soviets have introduced many, many more systems than the United States has. We had a gap between about 1970 and 1978 when the United States did nothing to modernize its strategic nuclear forces. Therefore, on the strategic side what we see is a need to really modernize those forces.

INVENTORY WARHEADS
BY AVERAGE AGE OF LAUNCHER
UNDER FREEZE — 1992



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The next chart shows what the implications will be if we did not carry out that modernization program. By 1992 the average ages of the strategic weapons would be greatly in favor of the Soviets. Most of their weapons would be between 10 and 15 years old. Most of ours would be between 25 and 30 years old. That is the fundamental rationale for needing to undertake this modernization program.

Senator **Warner**. Could you explain the words, "Under Freeze"? Was this chart prepared for a freeze debate?

Dr. **Wagner**. The chart, I think, was not perhaps prepared for any particular debate on the freeze, but it does point out what would happen if we either—you can say it one way or the other. You can say if we froze or if we failed to carry out our modernization program. I think in some ways they are synonymous.

The fundamental point, however, as you see, being the great disparity in ages that will result if we do not modernize the program.

May I go on to the next chart?

Senator **Warner**. Yes.

WE NEED INCREASES IN THE NUMBER OF STRATEGIC WEAPONS AS WELL AS IMPROVEMENT IN THEIR CHARACTERISTICS

- SOVIET MILITARY-RELATED TARGETS ARE:
    - BEING HARDENED
    - BEING DISPERSED
    - INCREASING IN NUMBER
- SOVIET DEFENSES ARE INCREASING AND IMPROVING
- SOVIET ARE IMPROVING THEIR CAPABILITY TO ATTACK OUR STRATEGIC FORCES
- WE CAN NOT PRESERVE DETERRENCE WITH TECHNOLOGY IMPROVEMENTS ONLY. WE NEED SOMEWHAT MORE WEAPONS TOO

Dr. **Wagner**. In addition to modernizing the systems, we also, as the first chart showed, require some numerical buildup in the number of weapons. This is principally because the Soviet target base has been becoming larger in numbers, more dispersed, and substantially harder. [Deleted] today and that trend will continue in the future. In addition, for other military targets like the Soviet infrastructure for the Red Army in the Soviet Union, the Soviets have a very active, and it must be a very expensive, program to disperse those targets, to build more caserns around the country, so that in terms of our fundamental doctrine of attacking the Soviet military structure, which is what they value, we would require more capability in terms of numbers in the future. That is why we are asking, in addition to the new types of warheads, for a modest increase in the numbers.

I should like to turn now to the other half of the Department of Energy program, the research and development for the longer term. I am going to skip the next chart and the next one as well and go on to this chart.

Advanced development in the past has paid off in today's weapons.

There will be a need for continuing improvements in the future, even with the kind of progress in arms control that we hope for and certainly if that progress does not occur.

[Deleted.] We need advanced develoment to avoid surprise.

Our capability in advanced technology, in and of itself, helps create a "deterred point of view" on the part of the Soviets.

There are four reasons why it is terribly important to continue the research and development toward improved features in the nuclear weapons going into the stockpile. I have listed those reasons there. The advanced development in the past has, in fact, paid off in today's weapons. Even if we get the kinds of arms control limitations that we hope to get, we will almost certainly need for purposes of improving the survivability of our forces, to carry out a modernization program as I have described, and those weapons for that program will require the improved features.

The third reason is [deleted]. It is a technology in which there is a lot of leverage. In order to avoid technological surprise, in order to avoid the Soviets developing something that we do not understand or could not match, we need to explore the possibilities in that technology with a vigorous advanced development program.

Finally, I think that our capability in advanced technology in and of itself helps to create a deterred point of view on the part of the Soviets.

Let me spend a minute or two on two of those points. The first one on the next chart——

Senator **Warner**. Would you please hold that chart one moment. During discussion on the question of nuclear freeze, Senator Thurmond, Senator Jackson, and myself and others use as one of our basic points the matter of safety; safety in terms of weapons handling, safety in the communities in which they are kept. Was that part of your consideration?

Dr. **Wagner**. Yes, sir.

Senator **Warner**. But it is not on the chart.

Dr. **Wagner**. It is not on that chart. As you know, among the features of nuclear weapons which have been steadily improved over the years is the safety and the security aspect of the weapons. That is a particularly important characteristic of them, especially I must say for weapons based overseas, where if there ever were an incident of a security or safety nature, it could call into question the whole concept of forward deployment of our weapons, and it might very well change the course of history.

Senator **Warner**. I certainly concur in that observation and the reason for interjecting myself at this point is to thrust on you and your colleagues the need to include these items in your briefing and so forth. While I recognize that you are primarily technically oriented, you must remember that you are making a record which those of us who interface with the public need to substantiate these programs.

Dr. **Wagner**. Yes, sir.

[Chart deleted.]

Let me address your point on the viewgraph after this next one. Let us skip the next one and go on to the following one, which I realize is a busy viewgraph. In the left hand side is a list which I don't expect you to be able to read, but a chronological list of all of the weapons that are in the stockpile today, from the earliest one introduced in 1957 at the very top, to the latest one currently in our planning at the very bottom. Along the top are the types of features that are built in to nuclear weapons, [deleted].

The next column shows three characteristics of safety: the point you made, Mr. Chairman, the incorporation of insensitive high explosives, enhanced electrical system safety, and unique signals to avoid an inadvertent detonation.

Then security features, command disable, PAL code, permissive links of various kinds, and finally logistical aspects in the far right-hand corner. You can see in our thinking about the features that go into the nuclear weapons that safety and security features are very, very dominant considerations in our view. Now, the research and development that has been carried out by the Department of Energy over the last couple of decades has contributed to substantial improvements in all of those features, and the time when a particular improvement comes in is shown as a blacked-in area in that chart. So what you can see is that in the current stockpile the earlier, older weapons do not have many of these good features, but as time has gone on the improvements have pervaded the stockpile until by 1990 or 1995 we will expect to see a stockpile which is characterized mainly by these improved features: operational, safety, and security.

That covers the point that I wanted to make on how valuable to us the research and development toward improved features are.

Advanced development in the past has paid off in today's weapons.

There will be a need for continuing improvements in the future, even with the kind of progress in arms control that we hope for and certainly if that progress does not occur.

[Deleted.] We need advanced development to avoid surprise.

Our capability in advanced technology, in and of itself, helps create a "deterred point of view" on the part of the Soviets.

The final point on this general area of advanced R&D that I would like to make, and if you will put the previous chart back on, is this bottom point. As we come to understand, and we are coming to understand better, how the Soviets view this competition between the United States and the Soviet Union, we see that what really deters them is their view, their image of themselves compared to their image of us. Now the image is made up of a lot of things. It is made up of the number of weapons. It is made up of the technical capabilities of the weapons, the way the military and the technical capabilities are interrelated.

The Soviets have today passed us in the numbers of weapons and the sizes of weapons, and in the throw weight of missiles. The one advantage we have left, which conditions their image of us as opposed to their image of themselves, is the technical capability, the technical characteristics. I believe that if the Soviets in some crisis were to have to make a hard decision about whether or not to attempt, let us say, a first strike, their view of the possibility of success would be very much determined by simply their feeling that they are and continue to be inferior in a technical sense. We must always continue to maintain our technical edge so that their view of their own position is one of technological inferiority.

The features that are built into the nuclear weapons themselves are an important contributor to their view of where they stand in technology. That is what comes out of the Department of Energy and the program. We feel that both production for the stockpile and continued R&D for the future for improved weapon features are terribly important to the Department of Defense.

This concludes the remarks I wanted to make. I have a minute or two that I could take questions, but I am sorry, I really do have to leave very shortly.

[The prepared statement of Dr. Wagner follows:]

PREPARED STATEMENT BY HON. RICHARD L. WAGNER, CHAIRMAN, MILITARY LIAISON COMMITTEE [MLC] TO THE DEPARTMENT OF ENERGY AND ASSISTANT TO THE SECRETARY OF DEFENSE [ATOMIC ENERGY] ON NUCLEAR WEAPONS PROGRAMS

Mr. Chairman and members of the committee, it is my pleasure to appear before you to discuss the Department of Defense's requirements and long-term objectives, as they relate to the Department of Energy's nuclear weapons program. I would like to highlight for you what I believe is the challenge facing the Departments of Defense and Energy and how, as I see it, we should face this challenge. I would then be pleased to answer your questions.

In the Nation's nuclear weapons program, the Department of Energy delivers two different kinds of products to the DOD; tangible, hardware products and intangible, idea products. Hardware products are all those things that support the current nuclear weapons stockpile, including not only weapons that already exist, but those whose production is approved or projected, as well. In the idea category are those things necessary for the continuing vitality of the advanced technology base which provides insurance against technological surprise as well as options to choose from for the farther future, and from which may result new, radically different nuclear weapons with which to strengthen deterrence, as well as less dramatic but still useful improvements. I want to say, up front, that these two different products are equally necessary, for reasons that I will develop later.

The DOE complex is now a year or two into a period of major challenge occasioned by the large projected weapon production workload to support DOD requirements approved by the President, and by the need to catch up in exploratory development, of which too little was done during the 1970's. [Deleted.]

In December 1982 my office published a document entitled "The Nuclear Weapons Production and RD&T Complex—DOE Support of DOD Requirements." This document was provided to this committee, and I urge that you review it in your consideration of the DOE program. [Deleted.]

[Deleted.] Let me briefly discuss the production requirements and the research needs from the DOD point of view.

Let me first say a few words about the DOD's needs for the current stockpile—the area in which the DOE product is hardware—and how we develop requirements for it. An overview of the history and projections for the stockpile is shown in chart 1. Among other things, it shows systems in production now, and systems in committed engineering development which will reach IOC during the next few years. Note that although we require increased production of nuclear weapons during the next few years, we are not just piling weapon on weapon. We are retiring many older weapons as new ones are produced. We are engaged in a modernization, not a major buildup, and the stockpile will remain below the peak levels of the midsixties.

The stockpile production plans are largely driven by three initiatives which together will assure that the U.S. continues to possess an adequate deterrent posture into the mideighties and beyond. These initiatives are:

[Deleted.]

The strategic modernization program, which emphasizes improving the survivability of our strategic forces and enhancing our capability to retaliate in accordance with our national strategy against the full spectrum of Soviet targets.

The longer range intermediate nuclear forces (LRINF) missile deployments, which will provide at least a partial counter to the Soviet missile threat to NATO.

The long overdue modernization of our other nonstrategic nuclear forces, which will improve the operational effectiveness, survivability, safety, security, and flexibility of this critical component of our overall deterrent posture.

These initiatives, which reflect the U.S. commitment to maintain a capability to deter Soviet aggression, will also help convince the Soviets to act in good faith with regard to negotiating arms reduction.

A detailed discussion of those warheads in production is contained in "A Report to the Congress on the Justification of Nuclear Warhead Build Levels and a Review and Justification of the Warhead Retirement Program," submitted jointly by DOD and DOE in February to the Committees on Appropriations and the Committees on Armed Services of the Senate and the House of Representatives. This report is the most comprehensive exposition of the reasons for the production requests made by DOD of DOE that we have submitted to the Congress for several years. While it would be inappropriate to review it system by system here. I would like to make a few general comments about the stockpile requests, since it is sometimes alleged that these requests are inflated or otherwise unrealistic. I believe this is not the case.

The weapon stockpile requirement is derived by a process which starts from the most general and high level national security policy objectives, then develops judgments about what defense postures are needed to deter the Soviets. It goes on to develop DOD force level requirements, taking into account realistic estimates of survival probabilities of our forces under attack, targeting, penetration of Soviet defenses, and logistics factors. There are many steps in this process that cannot be quantified, and are based on political and military judgment. They involve requirements based on formal operational plans (such as the single integrated operational plan and the strike plan of the Supreme Allied Commander, Europe), delivery systems availability, and our allies' requirements for nuclear support through programs of cooperation. So far what I have described is the process by which DOD plans its own nuclear system requirements.

Starting from DOD nuclear force level requirements, the translation of these considerations into stockpile plans per se (new production, retrofits and retirements) is very much a joint DOD/DOE activity. Both the DOD and DOE are fully aware that, because of resource limitations, every effort must be made to make the most efficient use of DOE's unique capabilities. However, both Departments are also aware that in some cases, broader national security considerations dictate warhead production and retirement schedules. For example, warhead delivery schedules that appear to be inefficient when viewed solely from the DOE point of view, must be phased properly with the generally much more expensive DOD delivery systems; support for arms control initiatives or sensitive agreements with our allies may require accelerated development and deployment that can result in "Peaks and Valleys" in the DOE production workload. While both Departments work closely and continuously to minimize those adverse impacts, both feel that the Soviet and Warsaw Pact military buildup requires an urgency of response that justifies any remaining problem areas for DOE.

For the strategic and long range INF systems, production quantities of nuclear warheads are nearly the same as the load capacity of delivery systems planned for deployment. In contrast to this, DOE production quantities for warheads for other nonstrategic nuclear forces cannot be derived in a simple way, solely from the number of available delivery systems, since many of the delivery systems are dual capable—both conventional and nuclear (for example, aircraft and artillery tubes). For these systems, the inventory requirements are driven much more by detailed operational and survivability requirements than by numbers of delivery systems. Determining these numbers is a matter of detailed analysis, leavened by military judgment that considers the growing capabilities of the pact forces. In this context, nuclear support of our allies is a significant factor in determining overall requirements, and deployment and retirement actions.

Besides new production, the other factor that determines the stockpile is weapon retirement. As older weapons are retired, their nuclear material is used to build new warheads entering the stockpile. From the point of view of special nuclear material availability, it might be proposed that we could retire even more of the current weapons earlier than currently planned. However, other considerations enter which dictate retaining some older weapons.

Older systems, including those dual capable systems that may no longer be as effective in the conventional mode, still constitute a major deterrent. If they were retired, they would have to be replaced by new weapons to retain the same level of deterrence.

In many cases, these weapons are the current centerpiece of formal programs of cooperation with allies. To further reduce their number without compensating modernization would diminish the valuable military capability and political commitment they represent for those nations—a commitment on the part of the U.S. to contribute to the defense of that nation, and a commitment by the nation to participate in NATO's common defense.

[Deleted.]

I have described the factors that go into the development of the weapon stockpile. While some of the considerations are not subject to rigorous quantitative derivation, I believe that they are thoroughly and responsibly worked out. [Deleted.]

[Deleted.]

Now I would like to say a few words about our farther future needs. We have a rather firm idea of the hardware product we need and expect from DOE for the next decade or so. Beyond those projections, we have only a rather vague idea of the product that we will need from DOE, but we do know that we must manage stockpile acquisition not only to obtain the weapons we need today and in the near future, but also with an eye to the distant future because we don't want technological surprises. Therefore, we in DOD are also vitally interested in advanced development for nuclear weapons.

Accordingly, I want to make a strong endorsement for a very vigorous advanced concepts development program in DOE, for four reasons:

Advanced development in the past has paid off in today's weapons.

There will be a need for continuing improvements in the future, even with the kind of progress in arms control that we hope for, and certainly if that progress does not occur.

[Deleted.] We need advanced development to avoid surprise.

Our capability in advanced technology, in and of itself, helps create a "deterred point of view" on the part of the Soviets. Let me take these points in turn.

What we really spend money on today in the weapon complex are new features and improved characteristics in warheads. Most of the RD&T effort goes for this, and the production effort would be substantially reduced if we built weapons today with the same features as those we were building 20 or even 10 years ago. So it's fair to ask whether we get our money's worth. I believe we do.

During the past 15 years or so, there have been a number of continuing and significant changes in the threat, in our understanding of our deterrence needs, and in other factors, including public perceptions, which have influenced our defense posture. Most of the R&D effort in the weapon complex has been devoted to improving weapon designs to meet requirements developing from these changes.

Starting in the late 1960's we began to see that the Soviet view of deterrence was not the same as ours. They thought much more in terms of attacking military targets, thereby limiting damage to their own nation, and perhaps working toward a true first-strike capability. This is sometimes called a "warfighting doctrine." We also came to realize that they value their military capability and their ability to maintain political control most highly. These views on their part were reflected in tangible ways. They began to harden, defend, disperse, and proliferate their military assets and their apparatus for political control.

Over a period of some years, we have been responding to these changes by reshaping our deterrent strategy to threaten what they value, rather than what we ourselves would value, and by developing an ability to attack the new target structure that reflects their values. These changes were reflected in new features for weapons systems and warheads themselves. For example, we needed higher yields to match harder targets, but still in small reentry vehicles because there are a great many military targets. We need bombs which could be delivered from very low altitudes to penetrate their massive and improved air defense, [deleted].

Although it has now been dismantled, we did develop the safeguard ballistic missile defense sysem. [Deleted.]

In theater nuclear weapons there has been a similar evolution. We deter the start of a war (either conventional or nuclear) by exhibiting the ability to halt and then destroy the Warsaw Pact's attacking forces. To make our nuclear response credible to both the pact leaders and our own allies, the weapons must be available for quick and flexible response, which means they must be forward deployed, and they must not produce so much undesired ("collateral") damage that their use is incredible. To be able to maintain forward deployment, and to allow many of our weapons in wartime to be delivered by our NATO allies, it was necessary to develop special command and control features. The resulting permissive action links (PALS) also provide some of the added security necessary in light of today's terrorist threat. We have continued to improve the PALS [deleted].

In recent years there has been growing concern, on the part of segments of the public, for safety issues, sometimes almost amounting to a demand for a risk-free world. While some of us may think these demands are excessive, they are real, and must be taken into account when we consider the public views of the trust put in us in our stewardship of nuclear weapons. Our nuclear weapons have always been designed with a high level of safety built in, and the record over the last 38 years has been excellent. There has never been an accidental nuclear explosion of a U.S. nuclear weapon. However, in response to the heightened sensitivity, today's nuclear weapons are built to even more stringent safety standards than was the case even a few years back. Let me give you a few examples in this area in which the DOE has achieved significant progress. The electrical systems and strong link/weak link pairs in our modern warheads provide nuclear detonation fail-safe protection beyond that thought achievable in the 1960's. This accomplishment was the direct product of a vigorous effort to develop system concepts and components which would respond in a predictably safe manner even in severe accident environments (fire, crash, etc.). The possibility of radioactive material dispersal in potential accidents involving nuclear weapons has been greatly decreased by use of insensitive high explosive (IHE) rather than the conventional explosives used in older weapons. Developing an IHE suitable for use in nuclear weapons required over 10 years of dedicated research and development. [Deleted].

So you can see that the advanced development done over the past 10 or 15 years has contributed substantially to making U.S. nuclear weapon designs much better suited to our political and military needs.

Changes since late 1960's

Deterrence requirements changed	*Warhead features in response*
Soviets value their military capability and political control.	Higher yield to size/weight. Higher yields. MIRV.
Soviets implement "warfighting" posture	Laydown bombs.
Soviet target base harder, dispersed	Warhead hardening.
Soviet defenses	[Deleted.]
Flexible response	Tailored outputs.
Reduced collateral damage	Nonviolent disablement.
Rise of international terrorism	Improved use control (PAL).
Increased emphasis on risk reduction—weapon safety/security.	Insensitive high explosive. Enhanced electrical safety.
Need to reduce cost of weapon system acquisition and increased readiness.	Maintainability. Longer component life.

This is shown graphically in chart 3, which outlines the improved warhead features developed in response to the changes I have just outlined in the broad political and military context, and chart 4 (chart deleted), which shows how these features have been incorporated in the stockpile. Of course, it is true that not all the ideas worked on have ended up as improved features for stockpile weapons. Some lines of research have not yet led to applications, and may never, but this is to be expected in R&D. In some cases, there are those who argue that some new features were not needed. There are also those who argue that more new features should have been put in certain weapons. I would not argue that the developments have always been just right. But on the whole the R&D has been very responsive to the need.

Turning now to the future, we might ask: Will continue development of advanced concepts lead to useful improvements in weapon features in the future, and will such improvements be needed? I believe so, on both counts. Even if our best efforts at arms control succeed we will need new nuclear weapon designs in the 1990's and beyond. If numbers of weapons are reduced, as we hope they will be, we will still need to insure that the most fundamental requirements of nuclear deterrence—survivability of our own weapons, crisis stability, ability to penetrate and destroy targets—are maintained. And as other technologies change, such as accuracy, command and control sensors, antisubmarine warfare, etc., we will need to meet these fundamental requirements in new ways. We will almost certainly need new systems with new characteristics and these systems will need new warheads. If we are to be able to meet the defense needs of 1990's and beyond, it is necessary for DOE to have an active, vigorous advanced development program now because there is a long-

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leadtime, 10 years or more, between the concept and the hardware. Some areas in which I believe new developments will be most fruitful are the following.

Especially for theater weapons, safety and security determine how we base and house weapons, which in turn determines how subject they are to disarming attack, either conventional or nuclear, by the Warsaw Pact. Improvements in safety and security features in weapons could lead to deployment approaches which greatly improve survivability, and the Soviet perception of the survivability of our nuclear weapons is a key factor in the stability of deterrence. In a broader sense, we must never stop safety and security improvements. If we do, the people on whom safety and security depend will become complacent or incompetent, an intolerable situation.

Another area of clear importance, where there is both significant opportunity and likely to be growing need, is for weapons in which the yield—the total energy produced by the explosion—is converted in some way to a form more precisely tailored to the need than just blast and heat. Such weapons might be used in much more discriminating ways than existing nuclear weapons—to apply enormous energy more directly onto the intended military target, to reduce the undesired damage to very low levels, to single out some particular type of damage—[deleted].

Such weapons might have their most important applications for defensive purposes [deleted]. Taking a long view, defensive systems may become much more important in the future. During the last decade of Soviet buildup of possible first-strike forces, and now that we are no longer superior, we have learned how important the survivability of our retaliatory forces is, [deleted].

[Deleted.] The President has called for the development of an intensive effort to define a long-term research and development program aimed at defensive capabilities to counter the threat posed by Soviet strategic nuclear ballistic missiles. Some of the advanced weapon concepts being developed by the Department of Energy could play a big role in fulfilling the President's desire.

[Deleted.]

The third reason why we need to stress advanced development is [deleted].

[Deleted.]

My final reason for accelerating DOE advanced technology relates to what I called earlier "keeping the Soviets in a deterred frame of mind." Deterring the Soviets has often been thought of simply as a matter of keeping the Soviet attack exchange calculations unfavorable to them, both in our view and in theirs, thereby avoiding a Soviet attack. However, we are beginning to know more about how Soviet leadership views the arms competition in which we are engaged, and we can now see more clearly that much more is involved in deterring them than the arithmetic of exchange calculations—which is, of course, what you would expect. What it comes down to in the end is to keep their image of themselves inferior to their image of us, so that if a crisis comes they will have a gut feeling that they won't measure up against us. It is often said that the Soviet leaders are conservative. They are when they feel inferior, but they often are not when they don't feel inferior: They often have taken advantage when they perceive an opportunity, such as in Cuba or Afghanistan. Our job is to keep them feeling inferior, and thus conservative.

The Soviets have always been concerned with "image"—their obsession with propaganda and legitimacy shows that. Their images of themselves and of us, in the context of deterrence, are made up of many things—numbers and sizes of weapon systems, their technical characteristics, general technological capabilities of the two societies, national will and purpose, and place in the flow of history. Because of their buildup they have passed us in the more quantifiable elements of the image comparison—numbers and sizes of weapons. [Deleted.]

[Deleted.] But on the other hand, we know that tests between our technologies, such as U.S.-made jets versus Soviet-made jets over the Beka'a Valley in Lebanon, and the technology of our cruise missile developments, are often sobering experiences for them. I believe that our level of technology in itself, quite apart from exactly how it is built in to fielded systems, affects their overall image of themselves and of us, and thus can have a significant deterrent effect.

The U.S.S.R. is pushing advanced technology hard, both in their own program and in getting it from us. They are active in improving the accuracy of their missiles. In [deleted] technology, in precision guidance, in cruise missile technology, we must not allow them to come to feel that the technological part of the balance has shifted in their favor, too. By the 1990's we'll need some really new technology to keep the image ratio in our favor. The technology of nuclear exposive design is an important part of our overall technological capability.

In summary, the challenge we face is to balance the production of specific nuclear warheads needed to maintain deterrence today, with the need to revitalize the technology base from which will develop the concepts that will become the hardware of the 1990's and beyond. The Department of Defense is grateful to this committee for the support that you have given to this challenge in prior years. We need and count on your continued support for this vital program this year also.

I would now be happy to attempt to answer any of your questions. Thank you.

Mr. **SMITH**. Mr. Wade, why don't you continue? Senator Warner will be back momentarily. If you can stay a few minutes, Dr. Wagner, I will see if the chairman has any questions for you.

Dr. **WAGNER**. OK, I will stay a few more minutes.

Senator **THURMOND**. Dr. Wagner, what you emphasize today is that we must go forward. We don't know exactly what the Soviets are doing and we cannot be caught by surprise. Therefore we must continue this research and development in order to be sure that we still stay ahead of the Soviets.

Dr. **WAGNER**. Exactly.

Senator **THURMOND**. Isn't that the point you make?

Dr. **WAGNER**. Yes, sir.

STATEMENT OF HON. TROY WADE, PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR DEFENSE PROGRAMS—RESUMED

Mr. **WADE**. I will now proceed with the budget for the Department of Energy, the budget request for fiscal 1984.

ATOMIC ENERGY DEFENSE ACTIVITIES
FY 1984 BUDGET SUMMARY
($ in Millions)

	FY 1983 P.L. 97-377		FY 1984 REQUEST	
	AUTHORIZATION	APPROPRIATION	AUTHORIZATION	APPROPRIATION
WEAPONS ACTIVITIES				
RESEARCH, DEVELOPMENT & TESTING	$1,177.6*	$1,181.6*	$1,376.6	$1,380.1
INERTIAL FUSION	151.0	189.7	144.3	151.8
PRODUCTION AND SURVEILLANCE	1,837.6	1.900.9	2,330.8	2,337.3
PROGRAM DIRECTION	53.3	53.3	55.9	55.9
SUBTOTAL WEAPONS	$3,219.5	$3,325.5	$3,907.6	$3,925.1
NUCLEAR MATERIALS				
MATERIALS PRODUCTION	$1,128.6**	$1,308.1**	$1,453.3	$1,485.3
DEFENSE WASTE AND BYPRODUCTS MGMT	458.4	518.7	662.3	611.5
SUBTOTAL NUCLEAR MATERIALS	$1,587.0	$1,826.8	$2,115.6	$2,096.8
SECURITY AFFAIRS				
VERIFICATION AND CONTROL TECHNOLOGY	$ 53.9	$ 53.9	$ 61.7	$ 61.7
NUCLEAR SAFEGUARDS AND SECURITY	47.4	47.4	52.0	52.0
SECURITY INVESTIGATIONS	28.5	28.5	29.5	29.5
SUBTOTAL SECURITY AFFAIRS	$ 129.8	$ 129.8	$ 143.2	$ 143.2
TOTAL DEFENSE PROGRAMS	$4,936.3	$5,282.1	$6,166.4	$6,165.1
NAVAL REACTORS	$ 382.9	$ 417.9	$ 590.0	$ 613.0
TOTAL ATOMIC ENERGY DEFENSE ACTIVITIES	$5,319.2	$5,700.0	$6,756.4	$6,778.1

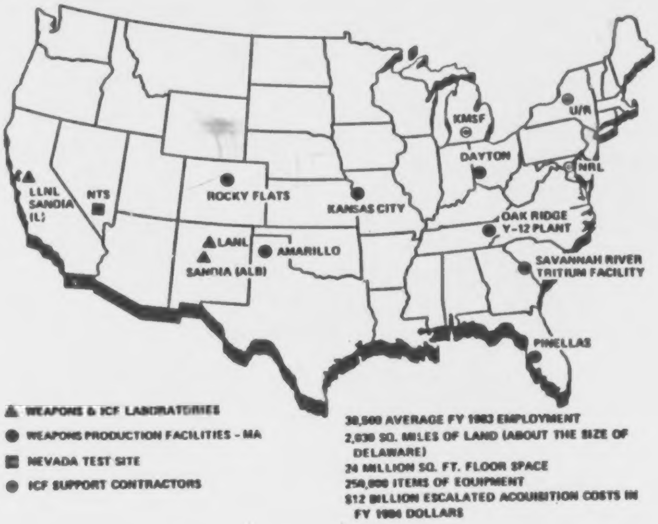
*EXCLUDES BUDGET COMPARABILITY OF $3.2M TRANSFERRED FROM WEAPONS PROGRAM DIRECTION

**INCLUDES $109M FOR NAVY FUEL ENRICHMENT TRANSFERRED TO NE IN FY 84 AND EXCLUDES $3.7M FOR PuO FACILITY OPERATION TRANSFERRED FROM NE

This is the summary of the total budget request for the Department for fiscal 1984. As you can see, it is up appreciably over the 1983 number. The total, as was pointed out, which includes naval reactors, is $6.7 billion. $6.1 billion of that is the defense programs part, which I will address today.

I will go through the budget as it was shown on that budget summary. So I will start first with the weapons activities.

DEFENSE PROGRAMS — WEAPONS ACTIVITIES


LLNL
SANDIA (L)
NTS
ROCKY FLATS
KANSAS CITY
LANL
SANDIA (ALB)
AMARILLO
KMSF
DAYTON
U/R
NRL
OAK RIDGE Y-12 PLANT
SAVANNAH RIVER TRITIUM FACILITY
PINELLAS
▲ WEAPONS & ICF LABORATORIES
● WEAPONS PRODUCTION FACILITIES - MA
■ NEVADA TEST SITE
● ICF SUPPORT CONTRACTORS

38,500 AVERAGE FY 1983 EMPLOYMENT
2,030 SQ. MILES OF LAND (ABOUT THE SIZE OF DELAWARE)
24 MILLION SQ. FT. FLOOR SPACE
250,000 ITEMS OF EQUIPMENT
$12 BILLION ESCALATED ACQUISITION COSTS IN FY 1984 DOLLARS

This will remind you of the location around the United States of the facilities associated with the weapons activities of the defense programs, the laboratories, the Nevada test site, and the plants around the production complex.

WEAPONS ACTIVITIES
FY 1984 BUDGET REQUEST
(IN $ MILLIONS)

	FY 1983		FY 1984	
	AUTH.*	APPROP.	AUTH.	APPROP.
OPERATING EXPENSES				
RESEARCH, DEVELOPMENT AND TESTING	$1,049.8	$1,049.8	$1,190.4	$1,190.4
INERTIAL FUSION	140.0	140.0	127.1	127.1
PRODUCTION AND SURVEILLANCE	1,474.5	1,474.5	1,779.7	1,779.7
PROGRAM DIRECTION	50.1	50.1	55.9	55.9
TOTAL OPERATING EXPENSE	$2,714.4	$2,714.4	$3,153.1	$3,153.1
CAPITAL EQUIPMENT	196.0	196.0	234.6	234.6
CONSTRUCTION	309.1	415.1	519.9	537.4
TOTAL WEAPONS ACTIVITIES	$3,219.5	$3,325.5	$3,907.6	$3,925.1

* BASED ON FURTHER CONTINUING RESOLUTION FOR FY 1983. PL-97-377

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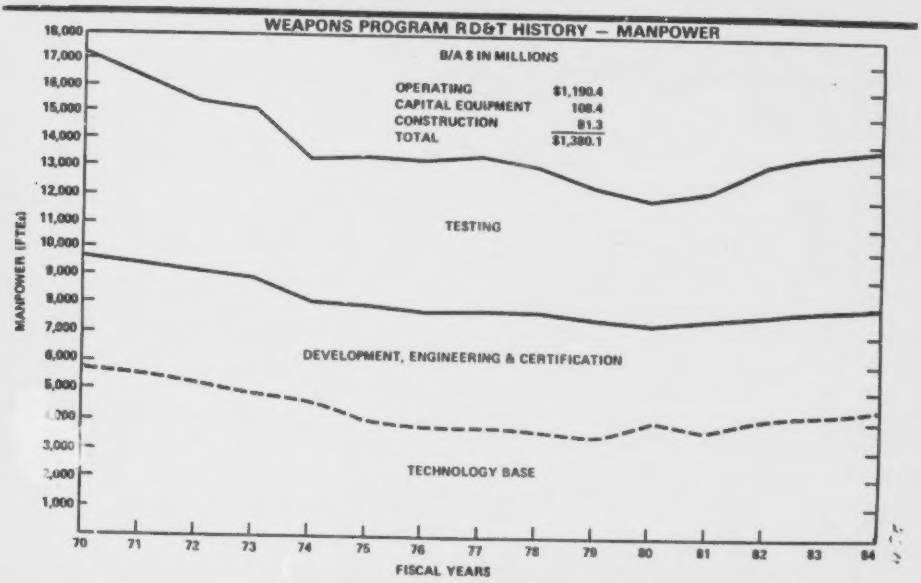
This is the budget breakdown for weapons activities, research and development, inertial fusion, and production, and surveillance. I will go quickly through those in that order.

RESEARCH DEVELOPMENT AND TESTING

At the Nevada test site, tests are becoming more complex. We are able to accomplish [deleted] not as many as we would like.

[Chart deleted.]

The next slide depicts the way the test program has altered in the last few years. You see what we describe as the decline of the seventies in both categories of testing: Development, engineering, and certification and the technology base. You see that the trend of the curve is moving slightly upward, which is a good sign, and we certainly hope they can continue that trend.



The next chart shows the manpower associated with research and development and the testing. One of the things that suffered the most in the decade of the seventies is the technology base, the new ideas, if you will, that Dr. Wagner spoke about that seem so important, and the growth there is modest but it is a growth, and we are pleased that this committee has been so helpful in the last 2 or 3 years in turning this trend around. One of the reasons that the turnaround is exceedingly important now was highlighted in the President's initiative of almost 3 weeks ago, where he talked about advanced weapons, defensive weapons. We have been and are working on [deleted] concepts of advanced weapons.

[Chart deleted.]

Here you see [deleted] depicted in cartoon fashion, the nuclear pumped X-ray laser, [deleted].

I want to mention briefly that a new initiative in the fiscal year 1984 budget is the revitalization of the test program itself. This committee has supported the restoration of the production complex and we hope that you will support what is a modest new initiative this year to revitalize the test facilities.

Here you see an example of trailers that were brought onto the test site in the late fifties as temporary structures and they are still there.

INERTIAL CONFINEMENT FUSION

Moving to the next line of the research, development, and test budget, I want to talk a minute about inertial confinement fusion.

[Chart deleted.]

These are the first two beams of the authorized 10-beam Nova glass laser in Livermore. This first portion of it is in and operating, and has proven already to be a tremendous adjunct to the research associated with advanced weapons concepts. The second of the technologies and the big machine is the Antares carbon dioxide laser at Los Alamos. It, too, is essentially complete and LANL has started beam qualification. [Deleted.]

The third of the technologies in the inertial confinement fusion program is depicted here. It is the particle beam fusion accelerator currently under construction at Albuquerque. Senator Warner, you have seen this machine.

Senator WARNER. How near completion are you?

Mr. WADE. Completion and operation is scheduled for 1986.

[Chart deleted.]

This is the Helios laser. It is difficult to see, and I apologize for that. [Deleted.] It is just another indication of the direction that we have taken with the inertial confinement fusion program. The program's basis of weapons physics is certainly coming to fruition as we apply more and more of the capability of all these machines to advanced weapons concept.

WEAPON PRODUCTION

[Chart deleted.]

Let me jump now into the weapons production itself. This is the famous mountain curve that you have seen many times before. You can see that we are well up onto that curve. The production complex is operating at almost capacity. The curve changes from time to time. There have been some reductions in the outyears with regard to air-launched cruise missile production. The Sentry, the ABM, has been scrapped for the moment, but you can see that we are well up on that chart. Nonetheless, as Dr. Wagner pointed, out, we are not building weapons on top of weapons. These two curves depict the current stockpiled weapons and the new builds. You can see there is not a dramatic increase in the number of weapons in the stockpile. In fact, we are modernizing and replacing obsolete weapons.

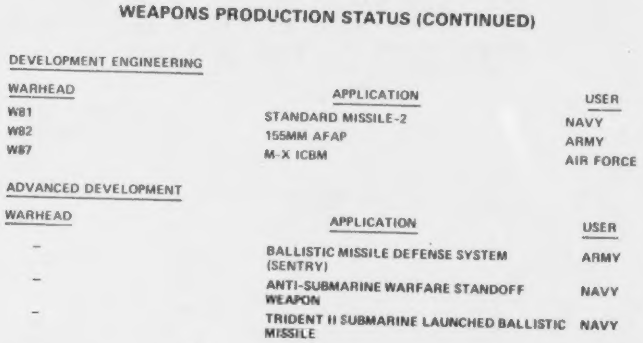
Under current production in our complex at the moment are these weapons systems.

Senator WARNER. Would you put that list back up again? Would you read them? We cannot read them from here.

Mr. WADE. I will be glad to read them, Senator Warner. The first two are modifications of the B–61 tactical bombs that are being built for the Air Force and Navy. The next is the W70 warhead for the Lance missile for the Army.

The Trident I, the Minuteman III, the W79 8-inch atomic-fired projectile, and the W80-1 air-launched cruise missile.

Going into production later on is the B-83, the new strategic bomb and the W84 warhead for the ground-launched cruise missile. The W85 warhead for the Pershing II will go into production shortly. The W80 warhead for the sea-launched cruise missile is at the bottom of the chart.



WEAPONS PRODUCTION STATUS (CONTINUED)

DEVELOPMENT ENGINEERING

WARHEAD	APPLICATION	USER
W81	STANDARD MISSILE-2	NAVY
W82	155MM AFAP	ARMY
W87	M-X ICBM	AIR FORCE

ADVANCED DEVELOPMENT

WARHEAD	APPLICATION	USER
–	BALLISTIC MISSILE DEFENSE SYSTEM (SENTRY)	ARMY
–	ANTI-SUBMARINE WARFARE STANDOFF WEAPON	NAVY
–	TRIDENT II SUBMARINE LAUNCHED BALLISTIC MISSILE	NAVY

Along with the W81 and W82, of course, we are working on the W87, the MX warhead. They all are in phase 3, development engineering. The warhead for the Trident II will move to phase 2A very shortly.

Of almost equal importance as the number of weapons being manufactured in our complex is the complexity of those weapons. That is difficult to portray, but what we show here is in standard equivalent work units.

[Chart deleted.]

I point out to you that on the left hand side of the chart you are looking at equivalent workload units per weapon in the 1970's. Look at the difference now as we move into the mid-1980's as we are manufacturing these newer, safer, more secure systems. They also have presented a much more difficult and much more complicated manufacturing process.

This committee has supported the restoration of our weapons production complex and we are very grateful for that. We would otherwise not be able to carry this tremendous workload that we are now carrying.

[Photograph deleted.]

Here are two examples. This is a 30-year-old lathe that was replaced by a numerically controlled 3-axis lathe which allowed us to achieve a 30-percent increase in productivity. So, the restoration program has really paid off and we are very grateful to this committee for its support.

NUCLEAR MATERIALS PRODUCTION

I should like to switch now to nuclear materials production and run very quickly through that program. This is to remind you of the sites around the country that are associated with nuclear materials production. Richland has the N reactor and reprocessing facilities. We have reprocessing facilities in Idaho for the Navy. You see there the two laboratories. We have the principal plutonium and tritium production facilities at Savannah River, some work at Oak Ridge, and two feed materials production plants in Ohio.

NUCLEAR MATERIALS PRODUCTION
FY 1984 BUDGET REQUEST
BUDGET SUMMARY
(IN MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
BASE	$ 793.2	$ 838.7	$1,028.9	$1,042.9
PRODUCTION INITIATIVES				
RESTORATION	26.0	122.1	133.8	133.8
L REACTOR UPGRADE	43.0	60.5	73.5	73.5
PUREX FUEL PROCESSING REACTIVATION	64.4	67.1	82.9	82.9
HIGH PRODUCTIVITY CORES	18.7	18.7	68.3	68.3
SPECIAL ISOTOPE SEPARATION	68.8	76.0	51.9	51.9
NEW PRODUCTION REACTOR	2.0	2.0	5.0	5.0
REACTOR SAFETY	7.2	16.2	8.6	14.6
SECURITY PROJECTS	0	1.5	0.4	12.4
	$1,023.3	$1,202.8	$1,453.3	$1,485.3

MATERIALS PRODUCTION BUDGET

This is the budget summary for nuclear materials production, showing you the fiscal 1983 appropriation and the fiscal 1984 request that is now before this Congress. I will talk briefly about some of the facets of this program.

[Chart deleted.]

NUCLEAR MATERIALS REQUIREMENTS

The Presidentially approved stockpile memorandum, which is our basis for production of nuclear materials and nuclear weapons, is depicted in this series of curves, which shows on the left the [deleted] of plutonium equivalent. Plutonium equivalent is a term that we use to allow us to discuss both the plutonium and the tritium that can be made in a reactor. So you are looking at plutonium equivalent and you can look across the years at where that material is going in the stockpile. You can see that the material in currently stockpiled weapons is going down as we are retiring some weapons.

[Deleted.]

In order to meet the stockpile memorandum requirements, you see depicted on this set of curves the variety of activities we are forced to do, that we have to do, that are reflected in the budget, in order to meet the requirements for the nuclear material. You see [deleted] plutonium equivalent, for example, being produced in the Savannah River reactors [deleted].

You also see the special isotope separation as we move out into the early 1990's. That of course will be used to clean up plutonium that exists in the inventory and make it suitable for weapons and finally in the very outyears you see the new production reactor coming on line.

The point is that a whole series of initiatives have been started, and will be funded through the next several years to meet the requirements of the stockpile.

[Deleted.]

STATEMENT OF DR. ROGER E. BATZEL, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. **Batzel**. [Deleted.]

Senator **Warner**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Senator **Warner**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Senator **Warner**. Thank you.

[Chart deleted.]

Mr. **Wade**. This depicts the way in which the five U.S. Government production reactors would be used over the years. You see us in 1983 going from four to five reactors; that is when L reactor in Savannah River comes on line. The top part shows the fraction of those reactors that is devoted to plutonium production. The bottom shows the tritium production. It will take essentially [deleted] to continue to supply the necessary tritium for the stockpile. We would hope that by the time we get to the end of this chart that we do have a new reactor available to continue to supply that tritium necessary.

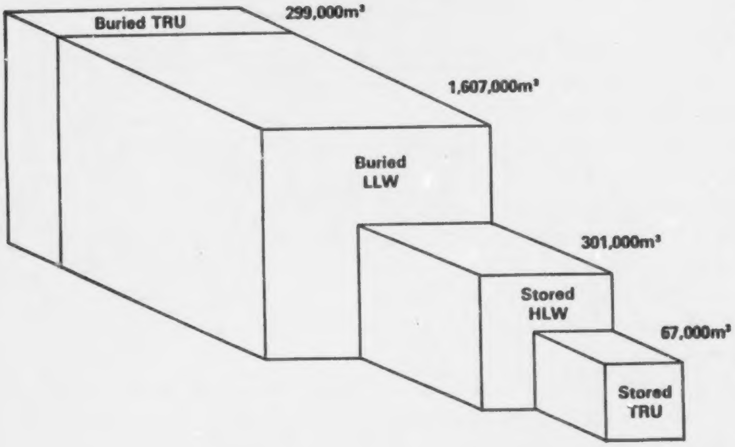
[Chart deleted.]

The prime reason for the new production reactor is this tritium decay curve. This depicts what would happen to the yield of the stockpile if suddenly we had no way to manufacture tritium. [Deleted.]

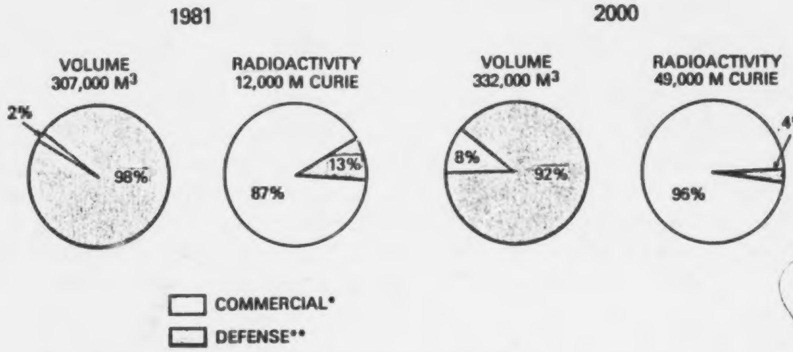
DEFENSE WASTE AND BYPRODUCTS MANAGEMENT

I will switch now to the defense waste and byproducts management part of the program.

The fiscal year 1984 authorization request is $662 million which is up over the 1983 authorization.


Defense Waste Inventory
(As of 12/31/81)

This is a picture of the inventory and it will show you the four forms of the defense waste. Now, this of course is differentiated from the waste produced in civilian reactors. This is defense waste, and of course, we do have a large volume.


HIGH LEVEL WASTE INVENTORY (12/31/81)

* INCLUDES SPENT FUEL AND ASSUMES REPROCESSING STARTS IN 1990
** ASSUMES DWPF STARTS IN 1990

The next viewgraph demonstrates or displays that in 1981, while we were producing 98 percent of the volume of high level waste, we represented only 13 percent of the radioactivity. Even with the new initiatives that are ongoing in our program at Savannah River, Richland, and Idaho, by the year 2000 we will still have 92 percent of the volume of high level waste in the country and down to 4 percent of the radioactivity.

[Photograph deleted.]

This is not a very good photograph, and I apologize, of the waste at Savannah River. We will be relying less and less on tanks like these once the Defense Waste Processing facility is in operation.

This is an artist's conception of the Defense Waste Process Facility at Savannah River. Of course, we are very pleased that this project is beginning construction in 1984 and will for the first time in the history of this country demonstrate that we can properly handle high level waste by glassifying liquid waste that is in tanks at Savannah River.

Finally, there is the waste isolation pilot plant in New Mexico. We have crossed a major milestone in that we have completed the site evaluation. That site evaluation report is now out for public comment. It is likely that we will hold public hearings on this in New Mexico. We hope that we will proceed toward total public acceptance of this and get on with this very important research and development facility.

VERIFICATION AND CONTROL TECHNOLOGY
FY 1984 AUTHORIZATION REQUEST
($ MILLIONS)

	FY 1983	FY 1984
OPERATING EXPENSES		
DETECTION TECHNOLOGY	$37.5	$41.6
ANALYTICAL SUPPORT	13.1	15.5
PROGRAM DIRECTION	1.8	2.8
TOTAL OPERATING EXPENSES	$52.4	$59.9
CAPITAL EQUIPMENT	1.5	1.8
TOTAL VERIFICATION AND CONTROL TECHNOLOGY	$53.9	$61.7

VERIFICATION AND CONTROL

This is the verification and control technology line of the defense programs budget for fiscal year 1984. [Deleted.] Here are the goals of the verification program: Develop and produce technology to monitor nuclear weapon activity and to verify nuclear test treaty compliance.

[Deleted.]

Second, to help control nuclear and energy related technology transfer problems.

Third, to provide technical and analytical support in arms control negotiations.

Fourth, to provide the very unique expertise that resides in the laboratories to the intelligence community as is appropriate. One of the most important programs is providing sensors for satellite packages that do a variety of tasks. One of the more important tasks at the moment is to increase the ability to detect above ground nuclear explosions around the world.

[Chart deleted.] [Deleted.]

This graph shows an example of a global positioning system satellite that has on it X-ray and optical sensors that were developed by the Department and its laboratories.

SAFEGUARDS AND SECURITY

The request for safeguards and security in fiscal 1984 is $52 million. That goes for a variety of things to include the development of technologies that will assist across the complex in protecting nuclear material and protecting weapons and in protecting information. This activity includes such things as hand geometry personnel identification devices to authenticate personnel entry into protected security areas.

ATOMIC ENERGY DEFENSE ACTIVITIES
FY 1984 BUDGET SUMMARY
($ in Millions)

	FY 1983 P.L. 97-377		FY 1984 REQUEST	
	AUTHORIZATION	APPROPRIATION	AUTHORIZATION	APPROPRIATION
WEAPONS ACTIVITIES				
RESEARCH, DEVELOPMENT & TESTING	$1,177.6*	$1,181.6*	$1,376.8	$1,380.1
INERTIAL FUSION	151.0	189.7	144.3	151.8
PRODUCTION AND SURVEILLANCE	1,837.6	1.900.9	2,330.8	2,337.3
PROGRAM DIRECTION	53.3	53.3	55.9	55.9
SUBTOTAL WEAPONS	$3,219.5	$3,325.5	$3,907.6	$3,925.1
NUCLEAR MATERIALS				
MATERIALS PRODUCTION	$1,128.6**	$1,308.1**	$1,453.3	$1,485.3
DEFENSE WASTE AND BYPRODUCTS MGMT	458.4	518.7	662.3	611.5
SUBTOTAL NUCLEAR MATERIALS	$1,587.0	$1,826.8	$2,115.6	$2,096.8
SECURITY AFFAIRS				
VERIFICATION AND CONTROL TECHNOLOGY	$ 53.9	$ 53.9	$ 61.7	$ 61.7
NUCLEAR SAFEGUARDS AND SECURITY	47.4	47.4	52.0	52.0
SECURITY INVESTIGATIONS	28.5	28.5	29.5	29.5
SUBTOTAL SECURITY AFFAIRS	$ 129.8	$ 129.8	$ 143.2	$ 143.2
TOTAL DEFENSE PROGRAMS	$4,936.3	$5,282.1	$6,166.4	$6,165.1
NAVAL REACTORS	$ 382.9	$ 417.9	$ 590.0	$ 613.0
TOTAL ATOMIC ENERGY DEFENSE ACTIVITIES	$5,319.2	$5,700.0	$6,756.4	$6,778.1

*EXCLUDES BUDGET COMPARABILITY OF $3.2M TRANSFERRED FROM WEAPONS PROGRAM DIRECTION

**INCLUDES $109M FOR NAVY FUEL ENRICHMENT TRANSFERRED TO NE IN FY 84 AND EXCLUDES $3.7M FOR PuO FACILITY OPERATION TRANSFERRED FROM NE

The final chart is a summary of everything that I have just quickly covered. The authorization request for fiscal 1984 before this committee is $6.1 billion. It is supported by the request in the stockpile memorandum developed by the Department of Defense.

That concludes my summary, sir.

VERIFICATION AND CONTROL

Senator **WARNER**. Thank you very much, Mr. Wade.

Mr. Wade, I was interested in the reference to your work on monitoring in connection with the verification procedures previously and those that are now being contemplated. Could you expand a bit on that? In your judgment, what are the new frontiers of verification and quite apart from the diplomatic likelihood of that occurring, what is the technical feasibility of some of these systems? I would like to have you respond orally and then amplify for the record on this question. Is your network of laboratories likely to have a major role in any of these new frontiers of verification?

Mr. **WADE**. The laboratories historically have played a major role in attempting to develop additional ways to verify.

[Additional information follows:]

NUCLEAR VERIFICATION TECHNOLOGY

Our national laboratories will, as they have in the past, continue to play a major role in all facets of this critical U.S. program. Currently, the laboratories are exploring state-of-the-art technology designed to support the future requirements of verification agreements. In this regard, they maintain a broad base of expertise and research in scientific fields relevant to verification concepts (e.g., seismology, propagation of electromagnetic radiation, and perturbations of the Earth's magnetic field, etc.). We believe our work in these and related fields will enable us to respond quickly to the specifics of future agreements.

In response to near-term commitments, we have been pursuing research and development in several areas of verification associated with the START/INF treaty negotiations. Anticipating the need to go beyond national technical means, we are studying and monitoring the flow of U.S. nuclear materials through the nuclear weapons production, deployment, and retirement cycles in hopes of devising methodologies for monitoring the Soviet Union.

[Deleted.]

Senator **WARNER**. There is one area which I will ask about specifically. It is likely to come to a political and diplomatic crossroad shortly. And that is the manufacture of chemical weapons. Would you be involved in that at all? We have to have some conclusive verification if a treaty is to be adopted by the Senate.

Mr. **WADE**. Senator Warner, the laboratories have been working with various members of the community on that problem. I am not prepared to address that. I would be happy to do that for the record.

Senator **WARNER**. Perhaps the laboratory directors can comment and then submit a statement for the record.

[The information follows:]

NEW FRONTIERS IN THE LLNL TREATY VERIFICATION RESEARCH PROGRAM

The vast majority of the treaty verification research activity at LLNL is directed toward improving our Nation's ability to monitor nuclear test ban treaties—the Limited Test Ban Treaty [LTBT], the Threshold Test Ban Treaty [TTBT], its companion the Peaceful Nuclear Explosion Treaty (PNET), and a possible Comprehensive Test Ban Treaty [CTBT]. In recognition of the nature of the problems included, seismic research plays a major role in our verification program's activities.

In the area of nonseismic research, there are three areas in which new verification technologies are being developed:

(1) Ionospheric detection of underground nuclear explosions

The discovery that underground nuclear explosions can produce perturbations of the ionosphere which, in turn, can be detected by radiowaves has opened up a potential new tool for the detection and identification of explosions. DOE has established a research program to more fully understand this phenomenon and, as our part, LLNL has concentrated on the development of a calculational model of the physical processes involved in propagating the acoustic disturbance from the surface to the ionosphere and in modifying the character of radiowaves being bounced off the ionosphere.

(2) Southern hemisphere marine sample exploitation

The unusual event in the South Atlantic in 1979 served to highlight the difficult problems of monitoring the large ocean areas of the Southern Hemisphere for small clandestine nuclear explosions particularly when information about the time and place of the possible explosion is fragmentary. This event also demonstrated the decisive role that collection (or absence) of radioactive bomb debris plays in making the final decision regarding the source of such events. In fiscal year 1981, DOE initiated a program to develop methods for improving our ability to collect debris in the Southern Hemisphere.

At LLNL, we are contributing to this effort in two ways: first, we are examining the possibilities of using the ability of plankton and other marine biota to assimilate and concentrate key fission products as a means to obtain useful radiochemical samples long after cloud sampling has become impossible. Second, we are improving our calculational capability to model the transport and diffusion of atmospheric radioactivity to include scavenging by time-dependent meteorological processes such as rain and snow.

(3) Onsite inspection (OSI) and onsite verification (OSV) technologies

DOE has been assigned the task of fielding the technical team that could be required for OSV activities provided for in the PNET. As part of the preparatory effort to carry out these responsibilities, LLNL has been active over the last 6 years in development of the technologies and equipment that would be required for these difficult and demanding tasks, should they be required.

With respect to the manufacture of chemical munitions, Livermore has not been asked to develop verification methods to detect or characterize such activities. However, the laboratory does very limited research for the DOD on the detection and modeling of toxic substances on the battlefield, and this and certain other technologies might be applied to verification at the stage of manufacturing.

VERIFICATION TECHNOLOGY

Sandia National Laboratories began its involvement with verification technology during the mid-1960's with the development of satellite instrumentation for monitoring the Limited Test Ban Treaty. Since that time, Sandia has had a vigorous and diversified program involving exploratory research and development, systems analysis, and systems development related to verification. As an engineering research and development laboratory, we have emphasized a complete systems approach to verification technology because this is essential to reliable and effective verification systems.

Sandia's broad experience in verification covers design and development of equipment for both national technical means and cooperative verification. This work includes:

(1) Satellite sensors and data processing systems to monitor the atmosphere and space for weapon detonations prohibited by the Limited Test Ban Treaty. In addition to developing sensors, we are responsible for systems integration of the verification package on the satellite with the data processing system at the ground station.

(2) National Seismic Stations which are capable of remote unattended operation to help verify compliance with nuclear test restrictions. Sandia was responsible for the design, development, and fabrication of a five-station test network which utilizes a satellite communications relay. This research network operating in Canada and the United States is an illustration of a complete verification system suitable for secure, remote, and unattended operation within the Soviet Union.

(3) Unattended, tamper-protected instrumentation to detect unauthorized operation of nuclear facilities or diversion of nuclear material to unauthorized uses. This work was done in support of IAEA inspection requirements under the Nuclear Nonproliferation Treaty.

In these programs we have pursued sensor, data acquisition and processing, authenticated data transmission, and system security technologies, as well as the analytical studies required to support the development work. Unique among these technologies are the security and data authentication techniques that are essential for unattended monitoring systems. In the National Seismic Station, we have produced the first working model of a verification system suitable for deployment within the Soviet Union. This system demonstrates what we believe will be required of cooperative verification systems to provide a proper balance between effective monitoring and acceptable intrusiveness.

Mr. **Wade**. [Deleted.]

W82 WARHEAD

Senator **Warner**. You have the W82 warhead. Review the situation respectively for the new warhead for the 155mm.

Mr. **Wade**. The W82 has a long and complicated history. The W82 155mm artillery-fired atomic projectile is completing engineering development and gun-launch testing. The design is firm and there are no technical problems that would prevent achieving the initial operational capability date of [deleted] that the Department of Defense has requested. The Department of Defense 155mm artillery-fired atomic projectile program has been fully funded and they have no technical difficulties that would prevent achieving the initial operational capability data. The delays in the program have been caused by insufficient funding from the Congress. Project No. 82–D–109 was cut from the $35 million requested for fiscal year 1982 to $15 million, and from $40 million requested for fiscal year 1983 to zero. [Deleted.]

Senator **Warner**. That concerns us greatly. We will have to do the best we can. Provide for the record side-by-side comparison of the current 155mm warhead and the W82.

Mr. **Wade**. We will be happy to provide that for the record.

Senator **Warner**. Would you list the advantages of the W82 also for the record?

Mr. **Wade**. Yes, sir.

[The information is classified and retained in committee files.]

Senator **Warner**. As you know, we have had opinions by some of our colleagues on that subject. It would be helpful if you could give us some unclassified data.

Mr. **Wade**. We will indeed, sir.

[The information follows:]

Information supporting need for modern 155mm artillery fired atomic projectile (W82):

(1) Replacement for the old 155mm nuclear projectile is badly needed.

Current projectile is near the end of its useful life. Modernization long overdue.

In the interim, Soviets have doubled their tactical nuclear force capabilities by deploying two new tactical nuclear missiles (SS 21 and SS 23) and three nuclear cannons (203mm howitzer, 240mm mortar, 152mm gun). Soviets already superior at longer ranges.

The 155mm howitzer provides more than two-thirds of NATO's short-range nuclear capability.

Allies have established requirements for the modernized 155mm nuclear projectile.

Short-range battlefield nuclear forces have been a key deterrent to war in Europe for 30 years.

(2) Tactical nuclear weapons prevent war by significantly influencing Soviet estimates of achieving operational success.

Soviets stress the capability to win quickly using large force ratios (5:1), before NATO can be reinforced.

In battle, one-half of the Warsaw Pact divisions will be in range of modernized nuclear artillery.

Massed Warsaw Pact forces thus present obvious nuclear targets for short-range systems.

(3) Nuclear artillery make NATO's outnumbered conventional forces more effective.

Dispersed "Nuclear Scared" Soviet forces are slowed and present lucrative targets to our conventional antitank forces.

Soviets are thus forced to find and attack our nuclear-capable units.

Since there are so many NATO 155mm units, this presents an immense military problem to Soviets.

(4) Individuals have expressed concern about cost, deployment, nuclear freeze, and nuclear threshold issues, and have suggested using conventional alternatives.

COST

DOD costs are minimal.

DOE direct production costs comparable to other systems.

DOE life cycle maintenance costs grossly distort the real system costs (present value costs) because they extend to 2017, and include inflation.

System costs as a whole (DOD and DOE) are low because round used by existing 155mm force structure.

DEPLOYMENT

Replaces old system. Thus, not an issue of introducing new type system into Europe.

NUCLEAR FREEZE

Should not be a freeze issue because replacing old systems on about a 1:1 basis.

Old projectile phased out as new projectile phased in.

NUCLEAR THRESHOLD

New projectile deters war, thus raising threshold.

New projectile also raises threshold by discouraging Soviet first use of their expanding battlefield nuclear forces.

U.S. use strictly controlled by President.

CONVENTIONAL FORCES ALTERNATIVE

Alternative does not in reality exist. Conventional systems cannot provide in-kind deterrence to Soviet first use of their short-range nuclear forces.

Cost of a conventional alternative prohibitive. For example, Copperhead is at least twice the cost to even approach the damage expectancy of the improved 155mm.

(5) Side-by-side comparison of the 155mm artillery fired atomic projectiles:

W48	*W82*
Technology:	
1950's era of slide rules and mathematical tables.	1970's era of pocket calculator.
Military effectiveness:	
Old system	Better reliability.
Limited use	Increased flexibility for employment.
Old system	[Deleted.]
Less accurate	Increased accuracy.
Limited range	Longer range.
Obsolete	Compatible with current and future NATO howitzers (strongly supported by General Rodgers, Supreme Allied Commander, Europe).
1950's command and control technology.	Modern command and control (modern Permissive Action Link [PAL]).
1950's safety technology	Modern safety features.
Costs:	
Not applicable	Comparable with other modern nuclear systems.

ARMS CONTROL INITIATION

Senator **Warner**. I sent you a letter the other day on arms control. Have you had an opportunity to make any analysis of that?

Mr. **Wade**. Just a very quick sort of personal analysis, Senator Warner. I believe the idea is something that ought to be pursued. I think one has to move very carefully because for a number of reasons we cannot get too locked into plutonium, because there are other nuclear materials that one can use to make nuclear weapons, such as U-233 and such as uranium-235 [deleted].

It is also, it seems to me, much more difficult to try to keep track of the plutonium that is not in weapons than it is to keep track of plutonium that is in weapons.

One of the reasons for that is the large uncertainty associated with production quantities. The Soviets, for example, have what appear to be dual purpose reactors, civilian power reactors that provide power for the civilian grid, but also manufacture plutonium. They are on line refueled. it is just very difficult to monitor or measure what that output really is.

We will be happy to do a detailed analysis of your letter and provide an answer for you as soon as we possibly can.

Senator **Warner**. I would appreciate that. We are all trying to determine if there are new areas in which we can make some progress.

Mr. **Wade**. I am sure the laboratory directors will be pleased to add to my comments.

Senator **Warner**. This is an area to analyze pro or con and then make some determination.

[The information follows:]

Arms Control Letter

The "plutonium accounting" approach to arms control, which has in the past been referred to as the nuclear materials cutoff and transfer proposal, was first proposed by the United States over two decades ago. It was looked at again in some detail in the late 1970's. In the first place, the proposal raises extremely difficult verification problems. Each side would have to assure itself not only that known facilities were not producing plutonium, but that there were not undeclared facilities and stockpiles of material. This would probably not be practical even in the unlikely event the Soviets were willing to accept safeguards on declared facilities. Another point is that it would be necessary to control U-233 and U-235, other fissionable materials, and facilities for enriching uranium; otherwise an agreement embodying the plutonium accounting concept could simply lead to a shift to greater reliance on such other materials. Finally, there would be complex problems arising from the transfer of weapons-grade material to an international agency. All in all, I do not believe that the plutonium accounting concept is a viable substitute for arms control measures specially limiting nuclear weapons. Eventually, after meaningful agreements limiting nuclear weapons have been achieved, a nuclear material cutoff and transfer proposal might be worth considering as a useful supplementary measure.

MX WARHEAD

Senator **Warner**. You have a reprograming request before the committee to reprogram funds into MX warhead facilities. I do not see how we can act until the President makes his MX report which, as you know, is likely to be forthcoming early next week. Then, of course, we have to await the action of the Congress. Nevertheless, will you amplify what your goals are in that reprograming action?

Mr. WADE. My understanding is that we have not really asked for a reprograming. We have asked for the release of $40 million of 1983 capital funds in order to allow us to proceed with the MX. We are committed to produce warheads in accordance with the President's stockpile memorandum which calls for delivery of W87 warheads for the Missile X [MX] system beginning in December 1986.

When we prepared the fiscal year 1983 budget request, we were aware that construction of the W87 warhead production facilities would need to be expedited in fiscal year 1983 if that production schedule is to be met. Under the first continuing resolution for fiscal year 1983, very limited construction progress was permissible. With enactment of Public Law 97-377, Further Continuing Appropriations Act, 1983, appropriations of $60 million were provided for MX warhead production facilities; but authority to obligate those funds was made contingent upon congressional approval in order to insure that expenditures on the warhead production facilities are consistent with congressional action on the MX missile system.

With the warhead delivery schedule fixed and the appropriated fiscal year 1983 funding unavailable for use, we wrote to the committees on February 15, 1983, saying that our ability to fulfill our MX warhead delivery commitments would be foreclosed unless MX project funding could be released immediately.

The purpose of our letter was threefold: First, to make certain that the committees are aware that the unavailability of MX funds is seriously jeopardizing our ability to meet the MX production schedule; second, to inform the committees that production of other weapon system warheads are dependent upon joint use of certain facilities to be provided in fiscal year 1983 under the MX project; and third, to identify for the committees that up to 40 million dollars' worth of facilities included in the MX project could proceed without waste if the decision is made ultimately to deny production of the MX warhead. An affirmative response to our current request would not constitute a congressional commitment to MX warhead production.

Of the $40 million identified, no less than $20.9 million is needed immediately for joint use facilities to protect the production schedules of several authorized weapons systems. The remaining $19.1 million would provide additional plant facilities needed for production of warheads for the MX or any other new weapon systems.

Senator WARNER. If you will excuse me, I need to attend another committee meeting for a few minutes. In the meantime my colleague, Senator Bingaman and counsel for the committee will continue the hearing.

Mr. SMITH. I would like to complete the question on the MX warhead. If you were given the go-ahead today on the MX warhead and the funding was not a problem, what is the earliest date that you could deliver the W87, assuming that is the warhead that goes on the MX?

Mr. WADE. Let me defer to General Hoover, if I may, on that question.

STATEMENT OF MAJ. GEN. WILLIAM W. HOOVER, DEPUTY ASSISTANT SECRETARY OF ENERGY FOR MILITARY APPLICATION

General HOOVER. We could begin producing the first warheads late in 1986 under the parameters that you have suggested, depending upon the number of warheads that would then be required to establish the initial operational capability. And that number could vary. It would probably take until early to mid-1987 to support an initial operational capability.

We probably could actually start producing weapons in 1986, assuming that we receive money.

Mr. SMITH. Assuming that you had the go-ahead today?

General HOOVER. Yes; or the next.

Mr. SMITH. How much flexibility is there in that schedule? How soon do you have to get the go-ahead to make a 1986 delivery?

General HOOVER. I believe if we were to receive the go-ahead by early July we could meet the date which I suggested.

SMALL MOBILE MISSILE

Mr. SMITH. Are you working on a warhead design for a small, mobile missile, since that seems to be an option that is surfacing with the President's Commission? Or have you looked at existing warheads that might be candidates for a small mobile missile?

General HOOVER. We currently have a phase I or an early conceptual study for our own advanced small mobile missile. Whether that is the system that is being proposed by the President's commission is unclear to us at this time. A short answer to your question is that we are looking at advanced warheads that would be suitable for a mobile missile. We also have designs which may be suitable, depending on the characteristics of the mobile system being proposed.

Mr. SMITH. Does your budget for fiscal year 1984 include funds specifically to do the R&D for a small mobile missile warhead?

General HOOVER. Not specifically to do any new warhead R&D for mobile missiles. Just conceptual study work.

Mr. SMITH. Senator Bingaman?

WASTE ISOLATION PILOT PLANT

Senator BINGAMAN. I have a question or two about the WIPP project. I was going to ask what the amount is in the budget this year for that project and what that would go into.

Mr. WADE. Let me ask Dr. Gilbert to answer that question.

STATEMENT OF DR. F. CHARLES GILBERT, DEPUTY ASSISTANT SECRETARY OF ENERGY FOR NUCLEAR MATERIALS

Dr. GILBERT. Our authorization request is $141.1 million in this budget for the WIPP project.

Senator BINGAMAN. What would that money go to primarily?

Dr. GILBERT. As you know, we have just completed the work required to validate the site in New Mexico. That is, the two bore holes and the connecting tunnels. The initial evaluation has been favorable and we have published a report to that effect. It is now out for public comment. Provided that there are no other obstacles that arise in that particular process and that we successfully get the land withdrawal we are asking for from the Bureau of Land Management, we would start construction on the surface in about July.

Senator **Bingaman**. Those are all the questions I have.

SMALL MOBILE MISSILE

Mr. **Smith**. Let me return, if I may, to the small mobile missile and option for a warhead. With regard to the type and size of the missile being discussed by the President's Commission, what kind of warheads are options and what kind of yields are we talking about?

Mr. **Wade**. Let me ask the laboratory directors to jump in here. I believe that we have some designs that are on the shelf. [Deleted.] One always has to question taking a design that has not been tested in a number of years and putting it in a stockpile without additional tests. Full-yield tests of these designs, of course, would be above the 150-kiloton limit.

I think it would be very dependent upon what the carrier looks like as to whether or not we can do anything with designs that are in hand.

Dr. **Batzel**. That is a fair statement of the situation, Mr. Wade. If you talk mobile, I think, one has to talk about insensitive high explosive. The W87, for example is configured that way. [Deleted.]

Now, whether when one looks at the final configuration of RV and everything that goes with it, one runs into difficulties I don't think we quite see at this juncture.

AIR QUALITY STANDARDS

Mr. **Smith**. Let me switch subjects and ask about air quality standards. The Environmental Protection Agency has promulgated some new air quality standards which involve radioactive releases. Would you review this situation for the committee and the potential effect that these standards would have on your ongoing operations?

Mr. **Wade**. The Environmental Protection Agency developed these new standards as a result of a lawsuit brought against them by the Sierra Club in the State of California. As they have proceeded toward development of these standards over the past 6 months, we have been working very closely with them. They use as their point of departure the fact that there was a 25-millirem standard imposed on the NRC licensed commercial nuclear fuel cycle facilities and yet we in the defense side and the non-NRC licensed nuclear fuel cycle facilities are still under the FRC guidelines of 500 millirem per year.

Pressures, I think, on the Environmental Protection Agency in the final days drove them to a range that we think is not realistic. The draft regulations that were published for comment in the Federal Register are 10 millirem per year whole body to 30 millirem per year individual organ at the site boundaries. We are now in a 60-day comment period on those proposed regulations. It is the Department's intent to testify in favor of changing those regulations.

If they stay, our initial look is that it may take as much as $200 million to bring our DOE facilities into compliance.

We also have great concern about the effect of such proposed regulations on the test program in Nevada.

So, the net result is that the outcome could be very, very disadvantageous to us if those regulations stay. We do intend to testify in favor of changing them.

Mr. SMITH. You indicated that you were consulted during the preparation of these standards. Did you file a dissent to the standards before they were promulgated?

Mr. WADE. No, sir. We thought we had negotiated an upper range with the Environmental Protection Agency that was closer to 100 millirem per year. Because of pressures on the Agency, they went back to their original position which was the 10 millirem per year. Since they were proposed standards and we would have a chance to publicly comment on them and speak against them in hearings, we did not file any dissent at the time of the publication in the Federal Register.

Mr. SMITH. Before the final standards are promulgated, will your department be called upon to coordinate with these final regulations? Is there some type of interagency group that decides what these final regulations will look like?

Mr. WADE. The mechanism is not really clear to me at this point, Mr. Smith. We have proposed that OSTP play a role in this in that they form a committee or put together a group to manage the Government's solution to this and review each agency input as part of the comment process. We have also asked that there be hearings held on the subject and we would hope to get a favorable reply to that, too. That is not a very good answer, but the game plan is not very well known at this time. There has been a man identified within the Department of Energy, Dr. Trivelpiece, as the focal point for leading the Department's battle, if you will.

Mr. SMITH. Let me ask you, for the record, to give us some information on what the proposed standards are, what your current standards are, and what costs might be potentially associated with that. Can you give us some indication as to background radiation versus this new standard? You mentioned 10 millirems. What do you and I get from living here in Washington?

Mr. WADE. Dr. Batzel just exceeded that standard by flying back and forth to California twice in a week.

Mr. SMITH. I think perhaps you could expound on that for the record. He has exceeded the millirem standard with one cross-country trip?

Mr. WADE. I think two round trips put him over the standard.

Dr. BATZEL. It is very close.

Mr. WADE. We will be happy to provide comparisons for the record.

[The information follows:]

PROPOSED AIR QUALITY STANDARDS RELATIVE TO RADIOACTIVITY RELEASES

On November 8, 1979, EPA listed radionuclides as a hazardous air pollutant under the provisions of section 112 of the Clean Air Act. On June 16, 1981, the Sierra Club filed suit in the U.S. District Court for the Northern District of California alleging that EPA had a nondiscretionary duty to propose standards for radionuclides under Section 112 within 180 days after listing them. On September 30, 1982, the court ordered EPA to publish standards within 180 days of that date. The proposed National Emissions Standards for Hazardous Air Pollutants [NESHAP], Standards for Radionuclides were published in the Federal Register on April 6, 1983. Public hearings were held on April 28-30, 1983, with Dr. Trivelpiece, a Department of Energy [DOE] representative providing testimony on April 28, 1983. Written statements can be entered into the record before, during, or within 30 days after the hearings. The DOE will provide additional comments for the record.

The proposed emission standard for DOE facilities is an indirect standard that limits emissions from each site to that causing an annual dose equivalent of 10 mrem to the whole body and 30 mrem to any organ of any individual. Also, EPA expects DOE facilities to continue to limit emissions to as low as reasonably achievable [ALARA], and has proposed a reporting requirement to descibe emission control technology. Our current standards, based on Federal Radiation Council recommendations for protection of members of the public, are 500 mrem/yr to whole body, gonads, or bone marrow and 1500 mrem/yr to other organs for maximally exposed individual at site boundary. The allowable dose to the exposed population is one-third of this limit. These, of course, are upper limits and, as just indicated, DOE does as a matter of policy further limit emissions through thorough application of the ALARA principle. Before DOE can comply with the proposed EPA standard, several issues need to be resolved:

(a) Nuclear weapon testing is not specifically stated as being exempt in case of an accidental venting. Although we plan the designs of our test shots to preclude venting, safety plans are developed for each test for a worst-case scenario involving the potential for venting. The current dose limits of 500 mrem to an individual and 170 mrem to the population presently cause delays to testing activities because of this planning assumption. Any lower limits would create additional expensive delays and could result in a lengthy suspension of operations should we be unable to ensure (in a worse-case scenario) that the proposed standards will not be exceeded or, on the other hand, should an accidental venting occur.

(b) Severe erosion of public confidence will result. Changing safety standards for nontechnical reasons will confuse the public as to what the actual effects of radiation are. They may erroneously assume that DOE facilities are unsafe and that existing standards which are utilized in these facilities are unsafe.

(c) No scientific evidence has been presented demonstrating a measurable benefit to public health under a more restrictive radioactive effluent standard. EPA has assumed a linear, nonthreshold, dose-effect basis for estimating public health hazards due to exposure. In fact, the long-term effects of low-level radiation are unknown; there are those experts who purport that radiation, at low levels, is in fact beneficial to the population. EPA has ignored the latest BEIR III report from the National Academy of Sciences which states: "The committee does not know whether dose rates of gamma or x-rays of about 100 mrads/year are detrimental to man."

(d) The proposed implementation method for the standard is often inaccurate. EPA states that the standard should be implemented using pathway and dose calculations based on EPA codes or another modeling technique approved by EPA. EPA's codes assume a point source, Gaussian plume, level terrain, and averaged meteorological data. The EPA model tends to be conservative and errors of a factor of 10 are admitted. Site specific modeling techniques would provide more accurate estimates of offsite exposures. EPA does not even address actual offsite monitoring as a method of compliance. This would be the most accurate method if the background variation is not too extensive and total emissions are detectable given this variance of natural background radiation.

(e) Calculations of dose to persons assumed to be living at the site boundary should be changed to the individual living the nearest to the site. Several DOE facilities are so remote that complying with a boundary site standard would be a significant waste of Federal funds. For example, in 1982, the external dose from the Los Alamos Meson Physics Facility [LAMPF] at the site boundary was 12 mrem, but only 8 mrem to the nearest individual.

(f) Financial impact of complying with the EPA standard, assuming projected operational levels, will be significant. Without considering additional monitoring and manpower costs, facility upgrades are estimated to be approximately $105M. These costs are preliminary estimates and are not design engineering estimates.

(g) Application of the best available technology [BAT] principle could cause additional financial impact. EPA intends that facilities subject to DOE standards shall use BAT even if compliance is possible with a lesser degree of control. If BAT is relatively equivalent to the principle of ALARA, then DOE could be considered in compliance after expenditure of the $105M identified in item f. However, if DOE is forced to apply BAT without regard to present emission levels or a cost/benefit analysis, then initial estimates of DOE-wide additional expenditures over and above the basic $105M would be approximately $140M. This preliminary total of $245M is arrived at without considering additional monitoring and manpower costs. Costs may rise additionally as design engineering estimates are developed. For example, at the Idaho National Engineering Laboratory [INEL], dose commitments to any member of the public near the INEL site have been less than .1 mrem/year. However, under BAT a noble gas recovery system at the Idaho Chemical Processing Plant [ICPP] could be required for compliance at an estimated cost of $53.1M.

(h) Failure to comply with the proposed EPA standard within two years of implementation could subject DOE facilities to litigation by several groups desiring shutdown of the weapons complex. Such action could seriously impact the Nation's defense ability. For example, the Y-12 Plant at Oak Ridge estimates that an October 1987 compliance date would be realistic. However, assuming an October 1985 compliance requirement, the Y-12 Plant would be exceeding the limit for about two years.

(i) The Clean Air Act does not restrict States and local governments from imposing stricter emission standards than the proposed EPA standard. Theoretically, standards in the micro rem/year could be established, creating tremendous financial impact, shutting down facilities of the weapons complex, or limiting promising research and testing of new technologies.

(j) The EPA does not address whether the proposed standard applies only to normal operations or includes accidental releases as well. Significant expenses will be incurred if facilities must be upgraded to eliminate all possible releases down to 10/30 mrem. In addition, if a release of 10/30 mrem should occur, it is not clear whether this could result in the shutdown of that facility for the remainder of the year.

In order that all of the above issues may be fully investigated, DP strongly recommends an extension of the comment period. Standards such as those proposed by the EPA must be based on scientific principles, equitably imposed, cost effective, and must be related to actual risk imposed rather than a theoretical model which does not account for a number of factors effecting actual facility emissions.

The proposed EPA standards were issued despite continued DOE/EPA consultation during their development. A chronology of DOE actions follows:

(a) August 13, 1982.—Furnished EPA copies of "DOE Effluent Information System [EIS] EPA Reports CY 1981."

(b) October 15, 1982.—EPA furnished to DOE a "Project Plan for DOE Facilities," document No. 3580C, and a proposed MOU between DOE and EPA concerning the Clean Air Act.

(c) October 22, 1982.—MOU signed between DOE and EPA.

(d) November 2, 1982.—Pacific Northwest Laboratory [PNL] forwarded the "Project Plan for Control Technology for Radioactive Emissions to the Atmosphere at DOE Facilities" to Savannah River Operations Office (SRO).

(e) November 5, 1982.—Coordination meeting between EPA and DOE regarding proposed study at SRO.

(f) November 20, 1982.—Forwarded a list of DOE operations office contacts to EPA pursuant to DOE/EPA MOU.

(g) December 7-9, 1982.—Informational meeting between DOE representatives and PNL.

(h) January 13, 1983.—EPA provided the first draft of the regulation to DOE.

(i) January 17, 1983.—PNL provided a draft document entitled "Control Technology for Radioactive Emissions to the Atmosphere at U.S. DOE Facilities."

(j) January 19, 1983.—Meeting between DOE and EPA representatives regarding radiation emission standards. Provided draft comments to EPA.

(k) February 28, 1983.—EPA and DOE meeting to discuss various issues. Possible compromise of standard discussed.

(l) March 4, 1983.—EPA and DOE meeting to discuss technical and cost analysis by EPA of DOE facilities.

(m) March 10, 1983.—EPA visited ORO facility for discussions on impact of proposed standard and technical analysis of EPA calculations.

If EPA is unwilling to resolve the outstanding issues involving the impact of the proposed standard on DOE facilities, then legislative action may prove the only available alternative.

FACT SHEET ON EPA PROPOSED AIR QUALITY STANDARDS FOR RADIONUCLIDES EMISSION

EPA proposed standard for DOE facilities

Emissions of radionuclides restricted to dose equivalent rate of 10 mrem/yr to the whole body, and 30 mrem/yr to any organ of any individual living nearby.

Compliance with standard determined by calculating dose to persons living for 70 years at site boundary.

DOE facilities shall use best available technology [BAT] even if compliance is possible with lesser degree of control: Operators should use as-low-as reasonably achievable [ALARA] concept in implementation; facilities should not increase emission to match standard limits and new facilities should use best available emission controls.

DOE will report to EPA annually on monitoring emissions, dose calculations, and programs implementing ALARA control.

DOE current standard (DOE 5480.1)

Chapter XI of DOE 5480.1 allows 500 mrem/yr to whole body, gonads, or bone marrow and 1500 mrem/yr to other organs for maximally exposed individual at site boundary. Allowable dose to the exposed population is one-third of this limit.

Standard based on Federal Radiation Council recommendation for radiation protection for members of the public.

Potential costs from EPA proposed standard

Field estimates have initially projected over $200M for facility modification, measurement, operational costs.

Uncertainty from these rough preliminary estimates result from difficulty in understanding EPA's intention of using BAT, flexibility in calculating dose from EPA's dose models, short review period to prevent obtaining budget quality estimates.

COMPARISON OF COMMON RADIATION SOURCES TO PROPOSED STANDARD OF 10/30 MREM/YR FOR DOE FACILITY RADIONUCLIDE EMISSIONS AT SITE BOUNDARY

	Whole-body equivalent dose (mrem/yr)		Comment
	Average dose	Range	
Cosmic[1]	45	30 to 130	Depends on elevation.
External (potassium-40 in soil)[1]	60	30 to 115	Depends on soil content.
Internal (potassium-40)[1]	25	None assumed.	Uniform mixing of food sources assumed for U.S. population.
Medical X-ray[1]	100	70 to 100	Data is for average bone marrow dose. Effective—whole body may be factor of 5–10 lower.
Air travel (coast-to-coast round trip, cosmic)[2]	5	None assumed.	1 trip/yr assumed Effective whole-body dose based on nominal lung dose of 30 mrad.
Radon in buildings[3]	36	do	Do.
Masonry in building (potassium-40)[4]	7	do	Do.
Total	278		

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[1] "Radiological Quality of the Environment in the United States," September 1977, U.S. Environmental Protection Agency, Office of Radiation Programs.

[2] A. W. Klement, et al., U.S. Environmental Protection Agency, Office of Radiation Programs (ORP/CSD–72–1) August 1972.

[3] U.N. Scientific Committee on Effects of Atomic Radiation, Sources and Effects of Ionizing Radiation, 1977 report to the General Assembly pp. 74–81.

[4] National Council on Radiation Protection Report No. 56 "Radiation Exposure from Consumer Products and Miscellaneous Sources."

NOTE.—The average American receives between 200–300 mrem/yr effective whole-body.

Mr. SMITH. Are there facilities you operate that could not meet that standard in any event, regardless of how much money you spend on them?

Mr. WADE. I think the biggest concern is the LAMPF facility in Los Alamos. As I understand it, it take several million dollars to comply with the 10-millirem standard, under the current operating parameters of LAMPF. If those parameters are changed then a new look will have to be taken. I am unaware of any defense facility where we think we can't get down to it or close to it. My biggest concern is the test program.

Mr. **Smith**. The underground testing program?

Mr. **Wade**. Yes, sir.

Mr. **Smith**. What kind of releases are associated with that test program?

Mr. **Wade**. I think it is a definitional problem. The proposed regulations right now do not exempt the testing program, but we understand EPA's intent. We are delighted to exempt weapons testing. We hope that comes to pass. If the testing program were not exempt, then we see situations developing down the road where we could be forced, we could be taken to court if we could not demonstrate that we never planned to conduct a test in which the results of a disaster would exceed 10 millirem, which of course is ridiculous. There is no way to do that. So we are hoping that the exemption will be in the standard.

NEW PRODUCTION REACTOR

Mr. **Smith**. Let me switch subjects to the new production reactor that Senator Jackson mentioned briefly. Let us see if we can expand on a few items with regard to that. Would you indicate the status of the decision as to the type of reactor and the location?

Mr. **Wade**. The Department last year chartered a blue ribbon committee to examine alternatives with regard to site and machine design technology. That committee submitted its report to Mr. Roser in December. That report is currently undergoing internal review within the Department. The conclusion of that committee's report was that they recommended building a heavy water reactor on the Savannah River site. That decision is undergoing review in the Department at this moment with regard to whether or not more attention should be paid to duality of site, for example, whether or not steam production should be looked at again. The Department is currently looking toward a decision in early summer, within the next month or so.

There are three proposed locations. There are at least three or four reactor designs that are under current consideration.

Mr. **Smith**. As I recall, the recommendation out of the special study group was that the heavy water reactor will not be an electricity producer.

Mr. **Wade**. That is correct.

Mr. **Smith**. Are you reconsidering that? Would you build a new reactor without having an electrical power component?

Mr. **Wade**. That is one of the questions that is currently undergoing review. Depending, of course, on what part of the country you are in, it would seem in the minds of some to be imprudent to spend the amount of money associated with a new reactor and not make byproduct steam available.

One position that is very clear within the Department is that we are not going to get into the electrical generating business. The question is whether or not we wish to make byproduct steam available at the fence line. That question is currently undergoing review.

Mr. **Smith**. Would your decision on the new production reactor coincide with your decision on special isotope separation?

Mr. **Wade**. It was not intended that that be the case, but both decisions are currently undergoing review in the Department. I would hope that we have an SIS decision within the next week or so. And it will be a couple of months or so before we have an NPR decision. They are both under review by the Secretary at this time.

Mr. **Smith**. Thank you, Mr. Wade.

Do you have any other questions, Senator Bingaman?

Senator **Bingaman**. I am not sure whether you are the right witness for this, but I want to ask a few questions about the President's proposed program in antiballistic missile weaponry. Is that something you can respond to or not?

Mr. **Wade**. I could, Senator, but I might suggest that when the three laboratory directors make their statements, they all three are going to mention that initiative and perhaps you could hold your questions until after they finish.

Senator **Bingaman**. Thank you.

Mr. **Smith**. I would suggest that we take a 5-minute recess. We will reconvene as soon as Senator Warner returns, which should be momentarily. We will then continue with the laboratory directors. Thank you very much, Mr. Wade.

Mr. **Wade**. Thank you, Mr. Chairman.

[The prepared statement of Mr. Wade follows:]

PREPARED STATEMENT OF TROY E. WADE II, PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR DEFENSE PROGRAMS

INTRODUCTION

Mr. Chairman and members of the committee, I am pleased to be here today to present the Department of Energy's fiscal year 1984 authorization request for the Atomic Energy Defense Activities under my direction. These are the Weapons Program, which includes the Inertial Fusion work; Verification and Control Technology; Nuclear Safeguards and Security; Security Investigations; Materials Production and Defense Waste Byproducts Management. The Naval Reactors program, under the Assistant Secretary for Nuclear Energy, will be addressed separately by Admiral McKee.

I have with me today our three Deputy Assistant Secretaries. Major General William Hoover directs our Military Application program, including Inertial Fusion. Mr. James Culpepper has responsibility for Verification and Control Technology, Nuclear Safeguards and Security, and Security Investigations; and Dr. F. Charles Gilbert manages the Materials Production and Defense Waste programs.

To provide a framework for my statement, let me briefly review the mission of the programs under my direction.

We are responsible for the design, testing and manufacture of all U.S. nuclear weapons.

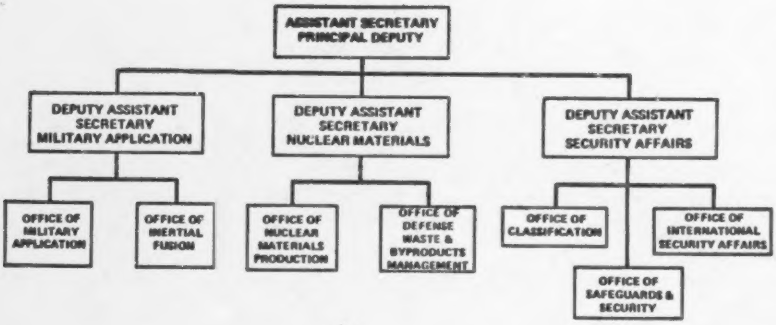
We are responsible for producing all of the nuclear materials required for the weapons program and managing the resulting nuclear wastes.

We are charged with the task of developing the inertial fusion technology support of the Nation's military needs, and as a possible future energy supply technology.

We support verification of international nuclear arms control agreements and control of sensitive technology and equipment exports.

We ensure the protection, control and accountability of special nuclear materials and the protection of DOE facilities.

And, we control the dissemination of classified information.


ASSISTANT SECRETARY
PRINCIPAL DEPUTY
DEPUTY ASSISTANT SECRETARY MILITARY APPLICATION
DEPUTY ASSISTANT SECRETARY NUCLEAR MATERIALS
DEPUTY ASSISTANT SECRETARY SECURITY AFFAIRS
OFFICE OF MILITARY APPLICATION
OFFICE OF INERTIAL FUSION
OFFICE OF NUCLEAR MATERIALS PRODUCTION
OFFICE OF DEFENSE WASTE & BYPRODUCTS MANAGEMENT
OFFICE OF CLASSIFICATION
OFFICE OF INTERNATIONAL SECURITY AFFAIRS
OFFICE OF SAFEGUARDS & SECURITY

Our Defense programs organization is as shown on this diagram. The work we must perform in fiscal year 1984 is prescribed by or flows from, the 1983–1988 Nuclear Weapons Stockpile Memorandum. This annual Presidential directive governing the production and retirement of all U.S. nuclear weapons is developed jointly by the Departments of Defense and Energy, is carefully reviewed by the National Security Council and is finally approved by the President. The Stockpile Memorandum is a balancing of the military judgments of the Joint Chiefs of Staff, requirements flowing from programs of cooperation with Allied governments, the delivery system deployment requirement of the Military Departments, the Department of Energy production capabilities, and budgetary considerations. As such, its development is complex and rigorous, requiring extremely careful consideration by high level officials at each step in the process.

[Deleted.] It should be noted, however, that over a several year period, the number of weapons in the stockpile is not increasing since the retirements of older weapons from the stockpile are substantially equal to the new production. The total yield of the stockpile has not been increasing, and in fact has been decreasing slightly in recent years due to retirements of older, higher yield weapons.

Rather than a "build-up" of the stockpile, the Departments of Defense and Energy are engaged in a long overdue modernization of the United States' strategic and tactical forces, as well as the Intermediate Nuclear Force of the North Atlantic Treaty Organization. This modernization will enhance the safety and security characteristics of our weapons, and it will strengthen the credibility of our nuclear deterrent, providing a very important backdrop for our ongoing arms control and weapon reduction negotiations.

[Deleted.] Increased materials production and processing creates a need for more waste management capability. At the same time, we are moving forward toward permanent disposal of our transuranic and high level wastes.

Additional to these expanding production activities is the continuation of the major effort in restoration and refurbishment of our plant and equipment for weapons manufacture, materials production, and waste management. In fiscal year 1984 we are requesting funds to begin revitalization of our weapons testing facilities.

In summary, we are in a very demanding situation. We are called upon to produce more weapons in fiscal year 1984 [deleted]. Simultaneously, we must manage our nuclear waste, prepare for its permanent disposal, rebuild much of our existing plant capability to rectify the effects of aging and insufficient maintenance, and upgrade some of our safeguards and security systems.

To many, this would seem an insurmountable set of tasks; however, their overriding importance to the security of this nation makes it imperative that we accomplish our goals. I believe this program has the most talented, dedicated, and highly motivated personnel that can be found anywhere. The contractor management and staff of our laboratories, test sites, production and processing plants and our federal employees in Headquarters and the field offices, are without equal. I am confident that with your help in providing the financial resources, we will continue to supply the nation's requirements for nuclear weapons safely, efficiently, economically, and on a timely basis.

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ATOMIC ENERGY DEFENSE ACTIVITIES
FY 1984 BUDGET SUMMARY
($ in Millions)

	FY 1983 P.L. 97-377		FY 1984 REQUEST	
	AUTHORIZATION	APPROPRIATION	AUTHORIZATION	APPROPRIATION
WEAPONS ACTIVITIES				
RESEARCH, DEVELOPMENT & TESTING	$1,177.6*	$1,181.6*	$1,376.6	$1,380.1
INERTIAL FUSION	151.0	189.7	144.3	151.8
PRODUCTION AND SURVEILLANCE	1,837.6	1.900.9	2,330.8	2,337.3
PROGRAM DIRECTION	53.3	53.3	55.9	55.9
SUBTOTAL WEAPONS	$3,219.5	$3,325.5	$3,907.6	$3,925.1
NUCLEAR MATERIALS				
MATERIALS PRODUCTION	$1,128.6**	$1,308.1**	$1,453.3	$1,485.3
DEFENSE WASTE AND BYPRODUCTS MGMT	458.4	518.7	662.3	611.5
SUBTOTAL NUCLEAR MATERIALS	$1,587.0	$1,826.8	$2,115.6	$2,096.8
SECURITY AFFAIRS				
VERIFICATION AND CONTROL TECHNOLOGY	$ 53.9	$ 53.9	$ 61.7	$ 61.7
NUCLEAR SAFEGUARDS AND SECURITY	47.4	47.4	52.0	52.0
SECURITY INVESTIGATIONS	28.5	28.5	29.5	29.5
SUBTOTAL SECURITY AFFAIRS	$ 129.8	$ 129.8	$ 143.2	$ 143.2
TOTAL DEFENSE PROGRAMS	$4,936.3	$5,282.1	$6,166.4	$6,165.1
NAVAL REACTORS	$ 382.9	$ 417.9	$ 590.0	$ 613.0
TOTAL ATOMIC ENERGY DEFENSE ACTIVITIES	$5,319.2	$5,700.0	$6,756.4	$6,778.1

*EXCLUDES BUDGET COMPARABILITY OF $3.2M TRANSFERRED FROM WEAPONS PROGRAM DIRECTION

**INCLUDES $109M FOR NAVY FUEL ENRICHMENT TRANSFERRED TO NE IN FY 84 AND EXCLUDES $2.7M FOR PuO FACILITY OPERATION TRANSFERRED FROM NE

In order to perform the work I have just outlined, our fiscal year 1984 Defense programs authorization request is for $6.166 billion, which compared with our fiscal year 1983 authorization of $4.936 billion based on the continuing resolution (Public Law 97-377) is an increase of 25 percent.

I will address each major component in some detail.

WEAPONS ACTIVITIES

WEAPONS ACTIVITIES
FY 1984 BUDGET REQUEST
(IN $ MILLIONS)

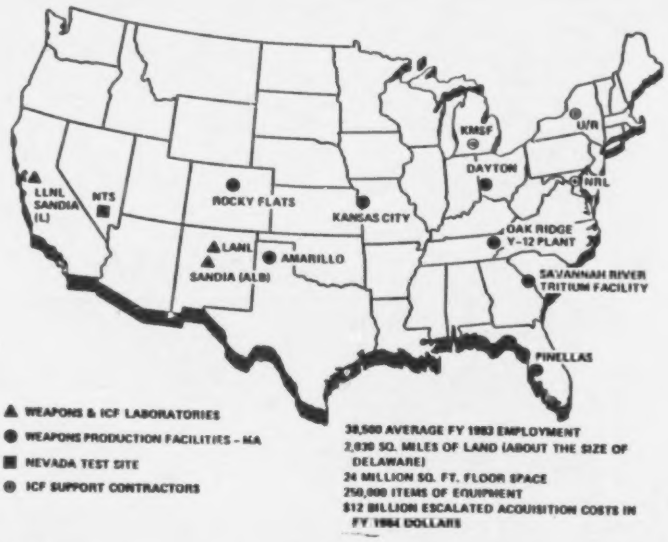
	FY 1983		FY 1984	
	AUTH.*	APPROP.	AUTH.	APPROP.
OPERATING EXPENSES				
RESEARCH, DEVELOPMENT AND TESTING	$1,049.8	$1,049.8	$1,190.4	$1,190.4
INERTIAL FUSION	140.0	140.0	127.1	127.1
PRODUCTION AND SURVEILLANCE	1,474.5	1,474.5	1,779.7	1,779.7
PROGRAM DIRECTION	50.1	50.1	55.9	55.9
TOTAL OPERATING EXPENSE	$2,714.4	$2,714.4	$3,153.1	$3,153.1
CAPITAL EQUIPMENT	196.0	196.0	234.6	234.6
CONSTRUCTION	309.1	415.1	519.9	537.4
TOTAL WEAPONS ACTIVITIES	$3,219.5	$3,325.5	$3,907.6	$3,925.1

* BASED ON FURTHER CONTINUING RESOLUTION FOR FY 1983. PL-97-377

The largest part of our weapons work is the Production and Surveillance function. Next is the Research, Development and Testing of new weapons systems. Then comes our Inertial Fusion activity, and finally, Program Direction. This is the smallest in terms of dollars, but of course it is absolutely essential.

The weapons program task is large, complex and important in our national defense structure. It includes three major laboratories doing work in theoretical and experimental nuclear and classical physics, mathematics, chemistry, hydrodynamics, metallurgy and other materials sciences, electronics, engineering and other such disciplines necessary for the design, testing, development and ordnance engineering of nuclear weapons. A large, remotely located test site is necessary for undergound nuclear explosive tests for both development and stockpile reliability purposes. A manufacturing complex is required with a spectrum of very demanding capabilities including fine watch making, heavy machining and fabrication of parts made of plutonium and other metals, high explosives, foam rubber and plastics. Microelectronics manufacture and even parachute fabrication are also required. Much of this work is at the very forefront of technology, and all of it must meet the most demanding standards of quality control, industrial safety, environmental responsibility, and security.

DEFENSE PROGRAMS — WEAPONS ACTIVITIES



38,500 AVERAGE FY 1983 EMPLOYMENT
2,030 SQ. MILES OF LAND (ABOUT THE SIZE OF DELAWARE)
24 MILLION SQ. FT. FLOOR SPACE
250,000 ITEMS OF EQUIPMENT
$12 BILLION ESCALATED ACQUISITION COSTS IN FY 1984 DOLLARS

These facilities are located as shown on this map. We are assisted in the management of these installations by the Department's Albuquerque, Nevada, Oak Ridge, Savannah River and San Francisco Operations Offices, and an exceptionally capable group of contractor organizations.

As I touched on briefly a moment ago, the specifics of what weapons we are to develop and build, the quantities and schedule for their delivery to the Department of Defense, the schedule and quantities of weapons to be retired from the stockpile, and the schedule for necessary retrofit work are coordinated between the Departments of Defense and Energy through the Military Liaison Committee. These detailed requirements are then documented in the annual Stockpile Memorandum and approved annually by the President, as required by the Atomic Energy Act of 1954, as amended.

PRODUCTION AND SURVEILLANCE

The production facilities for manufacture of U.S. nuclear weapons consist of several Government-owned, contractor-operated facilities in various locations around the country. [Deleted.]

The Rocky Flats plant near Golden, Colorado, fabricates and assembles our plutonium parts and performs retirement disassembly and chemical clean-up of recov-

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ered plutonium for recycle. The Atomics International Division of Rockwell International is the operator.

The Kansas City, Missouri, Plant, operated by the Bendix Corporation, manufactures electrical and mechanical components and performs most of our work with adhesives, rubber and plastic material.

In Miamisburg, Ohio, the Mound Facility is run by the Monsanto Research Corporation. Detonators, explosively actuated timers, initiators and transducers are manufactured here.

The Y-12 Plant in Oak Ridge, Tennessee, is operated by the Union Carbide Corporation and fabricates components from enriched as well as depleted uranium and lithium salts.

The Savannah River Weapons Facility near Aiken, South Carolina, performs extraction, purification and enrichment of tritium, recovers tritium and [deleted]. Dupont is the contractor.

Located near St. Petersburg, Florida, the Pinellas Plant is operated by the General Electric Company. Neutron generating devices, small radioisotopic thermoelectric generators, speciality capacitors and switches and similar electronic parts are made here.

At the Pantex Plant in Amarillo, Texas, high explosive parts are fabricated and weapon assembly is accomplished. Also, repair, disassembly, disposal and stockpile surveillance testing are done here. The Mason and Hanger-Silas Mason Company is the contractor.

The work load is increasing in each of these facilities, as we are tasked to build larger numbers of more sophisticated weapons.

The increase in our production effort, in standardized equivalent units of workload, is shown on this chart. These data are the most pertinent since they take into account the differences in difficulty and complexity among the several weapons systems we are producing and include the work necessary in any given year in preparing for future production.

NEW PRODUCTION

The following weapons will be in production in fiscal year 1984: The B-61 Mod 3 and Mod 4 bombs; W76 Trident warhead; W79-1 8-inch artillery-fired atomic projectile; W80-0 sea-launched cruise missile warhead; W80-1 air-launched cruise missile warhead; B83 Modern strategic bomb; W84 ground-launched cruise missile warhead; and W85 Pershing II missile warhead.

PREPRODUCTION ACTIVITY

[Deleted.]

[Deleted.] I requested on February 15, 1983, approval of the committee to obligate $40 million of the $60 million included in the fiscal year 1983 appropriation for continuing resolution of Peacekeeper warhead production facilities [deleted].

[Chart deleted].

This chart displays the nuclear weapons build schedule to support deliveries to the Department of Defense called for in the latest Presidential Stockpile Memorandum. You can see that builds are significantly above where they were a few years ago. An alternate build schedule is being developed to reflect the $99 million congressional reduction in operating funds in the fiscal year 1983 budget request.

To show some examples of the types of work needed to produce these weapons, please let me show you a few pictures.

[Photograph deleted].

Here is a photograph of a robot used in the production of neutron generators. The robot's arm is holding a component which is being cleaned by an air jet to remove particles. This robot performs a rather tedious job, and is also very cost effective.

[Vugraph deleted].

This vugraph shows the machining of high explosives components using numerically-controlled machines at our Pantex Plant in Amarillo, Texas. Once the original setup is made, the operator can move to a remote observation point.

[Deleted.]

PRODUCTIVITY IMPROVEMENTS

The weapons quantity and schedule requirements we face have demanded that we increase the productivity of our production complex. We have taken two major steps to increase our throughput, enabling us to work "smarter", faster, and with fewer mistakes resulting in rejects.

The first step, our restoration program, is familiar to this committee. This rebuilding of our manufacturing plants' utility systems and replacing obsolete and worn out machinery and other equipment is well along, now in its fourth year of funding. Here are a couple of before and after examples of the effectiveness of the restoration work.

[Chart deleted.]

This chart shows a cooling tower at our Y-12 facility which was obviously in very poor condition.

[Chart deleted.]

The next picture shows a new cooling tower constructed at Y-12 as part of the restoration program.

[Chart deleted.]

This chart shows a conventional, manually-operated lathe at our Kansas City plant, which required a highly-skilled operator with years of experience.

[Chart deleted.]

This chart shows one of the new Computer Numerical Controlled chucker lathes. This machine has been responsible for a 30 percent reduction in machining time.

[Chart deleted.]

The introduction of Computer-Aided Design and Manufacture systems which electronically connect our design laboratories and production plants is the second largest complex-wide improvement we are instituting. We are beginning to reap the benefits of this technology in terms of hours of design and drafting time saved, errors in communication avoided, and down time in the plants avoided since automatic machine tool programming is much faster. Many other such improvements are beginning to flow. These I have mentioned are just a few examples.

STOCKPILE MAINTENANCE AND EVALUATION

Stockpile maintenance does not sound very glamorous, but it is indeed a very important function funded under our Production and Surveillance budget. Included in this work is the [deleted] repair, modification, and modernization of older weapons to remain in service at least through the 1980's.

This latter aspect is our Stockpile Improvement effort, incorporating new technology in safety, security and command and control. That testing and inspection work on each system in the stockpile to assure its continuing reliability is known as Stockpile Evaluation.

These maintenance and evaluation efforts are of the utmost importance to the continued reliability of our nuclear deterrent; thus they must be carried out with extreme dedication and care.

BUDGET REQUEST

WEAPONS ACTIVITIES
FY 1984 BUDGET REQUEST
PRODUCTION AND SURVEILLANCE
($ MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
OPERATING EXPENSES				
WAR RESERVE NEW PRODUCTION	$ 912.1	$ 912.1	$1,100.3	$1,100.3
STOCKPILE MAINTENANCE	138.9	138.9	195.8	195.8
STOCKPILE EVALUATION	139.5	139.5	145.4	145.4
PROCESS DEVELOPMENT	79.6	79.6	96.6	96.6
OTHER COSTS	204.4	204.4	241.6	241.6
TOTAL OPERATING EXPENSES	$1,474.5	$1,474.5	$1,779.7	$1,779.7
CAPITAL EQUIPMENT	92.0	92.0	114.4	114.4
CONSTRUCTION	271.1	334.4	436.7	443.2
TOTAL PRODUCTION AND SURVEILLANCE	$1,837.6	$1,900.9	$2,330.8	$2,337.3

CHART 22

BEST COPY AVAILABLE

The total request for Production and Surveillance is about $2.3 billion. Operating expenses are $1.8 billion, Capital Equipment is $114 million and Construction is $437 million.

RESEARCH, DEVELOPMENT AND TESTING

The work constituting our weapons research and development program is conducted largely at the Department's three weapons laboratories—at Los Alamos, New Mexico, at the Lawrence Livermore Laboratory in California, and at the Sandia Corporation laboratories with branches in Albuquerque, New Mexico, and Livermore, California. As I mentioned earlier, these are large, broad-based, multidisciplined facilities, performing the physics and engineering designs for the United States' nuclear weapons.

Development and expansion of the weapons technology base to provide for our future weapons improvements is an essential part of our research and development. It includes: [deleted].

(2) Supporting research in electronics, materials, high explosives and similar disciplines;

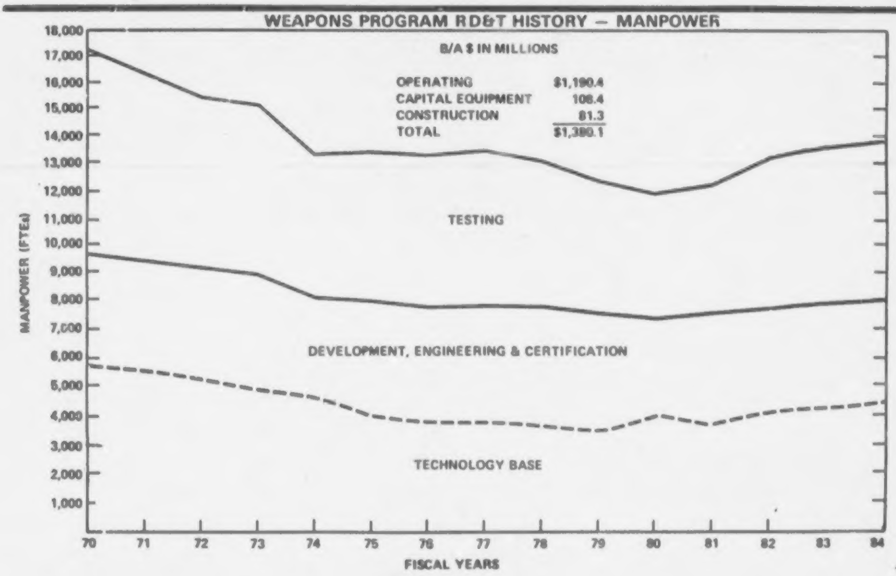
(3) Supporting technology in computers, material fabrication and processing, and work on advanced safety and security systems; and

(4) Advanced work in physics, mathematics, chemistry and engineering.

The second major area of the work of the laboratories is the application of the technology base to specific weapon development, engineering, and certification.

Systems which in fiscal year 1984 will be in the development phase prior to manufacture include the W80-0 warhead for the Sea Launched Cruise Missile, the W81 warhead for the Navy's Standard Missile-2, the W82 155mm Artillery Fired Atomic Projectile, the W-87 warhead for the Peacekeeper Missile, the warhead for the Sentry Missile, and the Trident II warhead. Several other weapons will be in conceptual or feasibility study stages.

Our weapons development effort, in order to be successful in meeting the current weapons needs, must have in hand the results of earlier forward-looking research. It must have ready for application the new physics concepts; the materials characteristics data, and processing and fabrication know how; the new high-explosives technology; and the myriad of advances in electronics, radiation hardening, and other technologies involved in our weapons engineering and manufacture.



During the 1970's, the funding support of our research and development effort declined in terms of real dollars about 37 percent and about 35 percent in terms of employment, one of the key measures of resources available. These declines forced us to abandon much of our forward research work, which we call technology base effort, in order to focus on the near-term production support requirements. We were living on the results of our past reserch work, and it was wearing thin.

In fiscal year 1981, that decline was reversed, and with the help of this committee, we have begun the climb back. Our goal now is to eventually achieve a level of 8,500 full-time employees in research and development. In fiscal year 1984 our employment will increase to 7,950. This increase will enable more effort in the technology base area which will form the basis for the new weapons of the 1990's.

Nuclear testing is an integral part of the research and development process. Ideas developed in the laboratory must be tested, refined, tested again, and so on in an iterative fashion. I am afraid that by our treatment of research and development separately from testing in the budget, we have drawn an artificial and misleading barrier between the two, indicating that they somehow are independent. Nothing could be further from the truth.

In the budget decline of the 1970's, the testing activity suffered, as did the advanced work at the laboratories. While the worth of the nuclear testing activity cannot truly be measured by the number of tests we conduct in any given year, this chart does show the fluctuations and general declines in testing. Starting in fiscal year 1981 we have reversed the decline [deleted].

The real merit of our test explosions is in the performance or diagnostic data that is collected on each shot. With improvements made over the years, we have become able to learn a great deal more from each test and therefore make each one much more valuable than was possible before. The total quantity of diagnostic data—the key measure of the scope of the testing program—has risen appreciably in the last few years.

Besides increasing our level of test activity, we also are requesting funds in fiscal year 1984 to begin a major test facility revitalization program in Nevada. Equipment and facilities at the Test Site, many of which originally were of a temporary nature, have become grossly inadequate. This initiative is made up of new facilities; modification, relocation and additions to existing facilities; and new and replacement equipment at the Nevada Test Site, and the North Las Vegas Atlas facilities. This is a crucial part of our ongoing upgrade of the research and development effort for which the Department needs the support of this Committee. These pictures show examples of the buildings to be replaced and facilities needing repair.

[Photograph deleted.]

The first example shows some of the antiquated living quarters at the Mercury Test Site. These trailers are well beyond their useful life. The interiors of some of these trailers are in very bad shape, as this photograph shows. The badly corroded showers in some of the trailers are really unfit for use, and leakage from these showers has also resulted in structural damage to the trailers. The current total cost estimate of this revitalization work is $600 million spread over five years.

Our RD&T effort is continually developing improved products and techniques for the weapons program. [Deleted.]

[Deleted.]

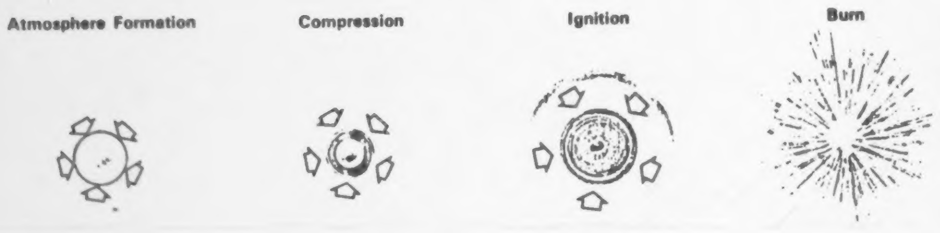
WEAPONS ACTIVITIES
FY 1984 BUDGET REQUEST
RESEARCH, DEVELOPMENT AND TESTING
($ MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
OPERATING EXPENSES RESEARCH AND DEVELOPMENT	$ 641.5	$ 641.5	$ 714.5	$ 714.5
TESTING	408.3	408.3	475.9	475.9
TOTAL OPERATING EXPENSES	$1,049.8	$1,049.8	$1,190.4	$1,190.4
CAPITAL EQUIPMENT	93.0	93.0	108.4	108.4
CONSTRUCTION	38.0	42.0	77.8	81.3
TOTAL RESEARCH, DEVELOPMENT AND TESTING	$1,180.8	$1,184.8	$1,376.6	$1,380.1

In order to accomplish the work planned for fiscal year 1984, our authorization request for Weapons Research, Development and Testing totals approximately $1.4 billion, $1.2 billion in operating expenses, $108 million for capital equipment, and $78 million for construction.

INERTIAL CONFINEMENT FUSION PROGRAM

INERTIAL FUSION CONCEPT



Laser or particle beams rapidly heat the surface of the fusion target forming a surrounding plasma envelope.

Fuel is compressed by rocket-like blowoff of the surface material.

With the final driver pulse, the full core reaches 1000 – 10,000 times liquid density and ignites at 100,000,000°C.

Thermonuclear burn spreads rapidly through the compressed fuel, yielding many times the driver input energy.

A useful complement to the full-scale nuclear testing effort is the inertial confinement fusion program, the concept of which is shown here. Our goal in inertial fusion R&D is to determine the feasibility of using laser and particle beams to ignite and burn very small amounts of fusion fuel. The high temperature, high density conditions of inertial fusion experiments has significance for weapons physics research and weapons effects simulation. Inertial fusion technology has matured to the point that useful weapons-related experiments are a significant part of the inertial fusion programs in the weapons laboratories.

WEAPONS ACTIVITIES
FY 1984 BUDGET REQUEST
INERTIAL FUSION
($ MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
OPERATING EXPENSES				
GLASS LASER EXPERIMENTS	$ 75.1	$ 75.1	$ 70.4	$ 70.4
GAS LASER EXPERIMENTS	41.8	41.8	38.2	38.2
PULSE POWER	20.0	20.0	18.5	18.5
SUPPORTING RESEARCH	3.1	3.1	0	0
TOTAL OPERATING EXPENSES	$140.0	$140.0	$127.1	$127.1
CAPITAL EQUIPMENT	11.0	11.0	11.8	11.8
CONSTRUCTION	0	38.8	5.4	12.9
TOTAL INERTIAL FUSION	$151.0	$189.8	$144.3	$151.8

We are requesting authorization of $127.1 million for operating expenses, $11.8 million for capital equipment, and $5.4 million for construction. This funding will permit us to continue a five-year plan which entails completing the three major facilities under construction in this program and operating them in the middle to late 1980's. These facilities will represent capabilities both for more effective weapons-related experiments and for developing the data base required for the long-term development of inertial fusion energy applications.

At Livermore, the two-beam Novette glass laser system has just been brought into operation. It will serve both to demonstrate the short wavelength laser technology of Nova, of which it comprises two beams, and to support both weapons concept and fusion scaling experiments. The initial experiments on the Novette schedule are related to [deleted].

The Antares gas laser at Los Alamos will be completed by the end of fiscal year 1983 and brought into operation early in fiscal year 1984. Antares will be a major addition to the capabilities of the laboratory to support weapons research and development and to contribute to the inertial fusion data base. [Deleted.]

The final facility to be funded under the ICF five-year plan is the Particle Beam Fusion Accelerator at Sandia, for which we are requesting authorization of $5.4 million in fiscal year 1984. With the scheduled operation of this and the laser facilities in 1987-1988 we expect to be able to determine the requirements for ignition and significant thermonuclear burn, for both weapons-related and potential civilian energy applications of this technology. The major program participants will be supported in both experiments and technology development by the major supporting laboratories, the Naval Research Laboratory, KMS Fusion, Inc., and the University of Rochester.

PROGRAM DIRECTION

The Program Direction account funds a small cadre of Federal employee in Headquarters responsible for overall Defense Programs management and policy direction and for Headquarters management of the weapons and fusion programs; and about 750 Federal personnel in the Albuquerque and Nevada Operations Offices who direct the day-to-day contractor activities in the field. Also included is the Community Assistance Program at Oak Ridge and Los Alamos, carried out under Section 91 of the Atomic Energy Community Act of 1955. The statutory purpose of the assistance is to compensate the Los Alamos and Oak Ridge communities for their lack of a normal industrial or commerical tax base and to attract and retain employees at the Federal energy facilities in those communities. This latter point is of great importance to the Defense Programs work at Los Alamos and Oak Ridge.

Our authorization request for Program Direction is just under $56 million.

Now let us turn to the Verification and Control Technology program.

VERIFICATION AND CONTROL TECHNOLOGY

The United States has a vital interest in the degree to which other nations observe their obligations under several nuclear weapon-related treaties. These include the 1963 Limited Test Ban Treaty, which in effect limits weapons tests to underground emplacement and detonation; the 1968 Non-Proliferation Treaty, which obliges the weapons states to work toward nuclear disarmament and obligates nonweapons states to forego nuclear weapons themselves, and the Threshold Test Ban Treaty (TTBT) of 1974 which limits the yield of United States and Soviet tests to 150 kilotons maximum. While the TTBT is not yet ratified by the United States, both sides have pledged to adhere to its provisions.

VERIFICATION & CONTROL TECHNOLOGY

GOALS

- **DEVELOP AND PRODUCE TECHNOLOGY TO MONITOR NUCLEAR WEAPON ACTIVITIES AND TO VERIFY NUCLEAR TEST TREATY COMPLIANCE**
- **CONTROL NUCLEAR AND ENERGY-RELATED EXPORTS AND TECHNOLOGY TRANSFER IN ACCORDANCE WITH NATIONAL SECURITY AND NONPROLIFERATION POLICY**
- **PROVIDE TECHNICAL AND ANALYTICAL SUPPORT FOR DOE'S ROLE IN NUCLEAR ARMS CONTROL NEGOTIATIONS**
- **MANAGE DOE'S INTELLIGENCE PROGRAM AND PROVIDE UNIQUE EXPERTISE TO THE INTELLIGENCE COMMUNITY**

The purposes of the Verification and Control Technology program are to support the United States efforts in monitoring the activities of other nations relevant to these international agreements; to provide the Department's technical expertise in the application of export controls on sensitive nuclear technology and other items of national security concern as required by the Nuclear Non-Proliferation Act, the Export Administration Act and other regulations and Executive Orders; to support ongoing arms control negotiations, policy formulation and certain intelligence activities, and to meet the Department's intelligence requirements.

Activities within the Verification and Control Technology program fall into two functional categories—detection technology and analytical support, both of which draw upon the unique expertise, skills and resources of the national nuclear weapons laboratories.

NUCLEAR DETECTION TECHNOLOGY

The detection component of the program encompasses a wide range of technologies related to the detection of nuclear weapons activities—spaceborne sensors, seismic and nonseismic detection, debris collection, sample analysis, and other scientific efforts.

SPACEBORNE SENSORS

Our space effort develops and maintains U.S. capability to detect [deleted] nuclear explosions from spaceborne platforms [deleted].

The effort includes research and development, the actual fabrication of sensor packages, and operational support, including analysis of data collected.

In fiscal year 1984 the Department will continue to furnish nuclear explosion detection subsystems, but in larger numbers than previously, for the Global Positioning System, [deleted] and other Defense [deleted] satellites, in accordance with delivery schedules coordinated with the Department of Defense [deleted].

SEISMIC DETECTION

DOE's seismic research program is fully coordinated with other agencies having similar responsibilities, [deleted], and the Defense Advanced Research Projects Agency. The aim of the program is to determine the effectiveness of regional—that is, short-range—seismic signals for monitoring compliance with nuclear test ban treaties. Such regional seismic monitoring would augment teleseismic—that is, long-range monitoring, aiding in distinguishing nuclear explosions from other seismic events and measuring their yield. Teleseismic monitoring is a function of the Atomic Energy Detection System, which is managed by the Air Force [deleted]. Regional data would be integrated into the Atomic Energy Detection System.

We plan no significant changes in our seismic detection effort for fiscal year 1984. A main element is the five-station Regional Seismic Test Network deployed in the United States and Canada and linked via satellite to a control point in Albuquerque, New Mexico. The network will continue in operation as a research tool for learning how such an in-country system might be used to monitor compliance with nuclear test ban treaties.

NONSEISMIC DETECTION

The nonseismic detection program also will continue without major change. The program has two main components—infrasonic monitoring, which would monitor extremely low frequency sound signals, and ionspheric monitoring, which would measure perturbations of the upper atmosphere. The aim of these research and development efforts is to determine whether these techniques can be relied upon as long-range supplementary means of verifying compliance with nuclear test ban treaties. A main purpose is to use the infrasonic or ionospheric signals as a means of distinguishing underground nuclear explosions from earthquakes, thunderstorms, missile launches or other natural or man-made phenomena.

[Deleted.]

ON-SITE MONITORING

The Peaceful Nuclear Explosions Treaty, which along with the Threshold Test Ban Treaty awaits ratification, provides for the United States and the Soviet Union to conduct observations and examinations on each other's territories for certain peaceful nuclear explosions. This on-site monitoring provision is unique in arms control agreements with the Soviet Union, and the United States hopes that someday the on-site principle will be widely applied. The aim is to minimize the chance that a country, under the guise of conducting a "peaceful" explosion, will gain military benefits otherwise banned. If the Peaceful Nuclear Explosion Treaty is ratified, the United States must be prepared to exercise its on-site monitoring rights. The Verification and Control Technology program has developed the necessary equipment and has designated Defense Programs personnel with the necessary skills to participate in an on-site verification team. The fiscal year 1984 funding request will enable the Department to maintain the equipment in readiness.

ANALYTICAL SUPPORT

Analytical support activities fulfill our responsibilities in export control, technology transfer, international scientific exchange, arms control, weapons intelligence and proliferation intelligence. These activities marshal the expertise, data and analysis to take part in formulating and implementing arms control policy, to meet national needs in understanding foreign nuclear weapons programs and nuclear proliferation, and to control the export of weapons-related and energy-related materials and equipment and the transfer of associated technology.

EXPORT CONTROL, TECHNOLOGY TRANSFER AND INTERNATIONAL EXCHANGE

It is our responsibility to review proposed nuclear and energy-related exports, technology transfer, and international cooperation and exchange agreements to insure that these activities are consistent with U.S. national security and nonproliferation objectives.

Because of the unique experience and resources of the DOE nuclear weapons complex, we are also called upon to support the Defense Department in identifying militarily critical technologies and to support the Departments of State and Commerce in carrying out their important responsibilities for controlling U.S. exports and international cooperation and exchanges.

In the past year we have improved our efficiency in the export control process by increasing use of a computerized suspense and follow-up system. We reviewed approximately 7,500 Commerce export license applications in 1982 and acted on about 85 percent within the initial 30-day period mandated by the Export Administration Act. The remaining 15 percent required additional time because of the need for detailed technical analysis and, in some cases, review by the Subgroup for Nuclear Export Coordination for which the Department provides the Secretariat. The subgroup is an interagency panel established to consider and consult on proposed nuclear exports and related issues.

In addition to dealing with the export review workload, we have been and will continue to be deeply involved in the implementation of a Presidential directive to seek agreement with other nuclear supplier countries on the conditions that should be applied to sensitive nuclear exports.

ARMS CONTROL POLICY AND NEGOTIATION

The Verification and Control program has the primary responsibility for Defense programs in the arms control arena, participating in the United Nations' Committee on Disarmament and bilateral and trilateral negotiations on possible nuclear test limitation agreements, participating in the interagency backstopping committees supporting negotiations, and arranging for weapons laboratories scientists to provide technical representation as necessary.

There also are occasional major interagency reviews of arms control policy of direct relevance to the nuclear weapons program. A recently completed review thoroughly examined U.S. policy on nuclear testing limitations, including U.S. positions on existing and future treaties. One conclusion reached was to consider seeking additional measures to make verification of the Threshold Test Ban and Peaceful Nuclear Explosion Treaties more effective. Our arms control experts now are involved in an interagency study to determine what kinds of additional verification measures the United States should propose.

WEAPONS INTELLIGENCE

The Intelligence Community traditionally has turned to DOE and the intelligence elements of the Department's nuclear weapons complex for expertise in the analysis of information regarding foreign nuclear weapons. [Deleted.]

PROLIFERATION INTELLIGENCE

The basic objectives of the proliferation intelligence program are set generally by the Nuclear Non-Proliferation Act of 1978 and more specifically by the Director of Central Intelligence and the Department's requirements. All reflect the general U.S. determination to impede the spread of nuclear weapons. Specific activities within the program are initiated and pursued in coordination with the Director of Central Intelligence Special Assistant for Nuclear Proliferation. In supporting Intelligence Community efforts to detect and assess foreign nuclear energy and nuclear weapons-related activities, the program relies to a major extent on its access to the skills and experience of the DOE nuclear weapons complex. The proliferation intelligence effort directly contributes to formulation and implementation of U.S. nonproliferation policy; it is also valuable in the negotiating and monitoring of international nuclear agreements and in reviewing proposed nuclear-related exports.

VERIFICATION AND CONTROL TECHNOLOGY
FY 1984 AUTHORIZATION REQUEST
($ MILLIONS)

	FY 1983	FY 1984
OPERATING EXPENSES		
DETECTION TECHNOLOGY	**$37.5**	**$41.6**
ANALYTICAL SUPPORT	**13.1**	**15.5**
PROGRAM DIRECTION	**1.8**	**2.8**
TOTAL OPERATING EXPENSES	**$52.4**	**$59.9**
CAPITAL EQUIPMENT	**1.5**	**1.8**
TOTAL VERIFICATION AND CONTROL TECHNOLOGY	**$53.9**	**$61.7**

The Verification and Control Technology authorization request for fiscal year 1984 is $61.7 million, which includes $59.9 million for operating expenses and $1.8 million for capital equipment. The operating expense figure includes $2,750,000 for program direction. The fiscal year 1984 increase of $7.8 million over fiscal year 1983 is attributable to increased deliveries of nuclear explosion detection sensors which ride on various satellites, increased requirements for technical analysis of national security issues related to nuclear weapons, and DOE intelligence responsibilities.

NUCLEAR SAFEGUARDS AND SECURITY

Now, I would like to turn to the Safeguards and Security program.

The mission of the Safeguards and Security program is to assure adequate protection for nuclear weapons and devices, nuclear materials, facilities and classified information under Department of Energy control and to participate in programs of international cooperation designed to minimize the risk of proliferation of nuclear weapons. Within the Department, the Safeguards and Security organization establishes Department-wide policies and procedures and develops components and systems for assuring such protection. For the most part, the cost of implementing these policies is the responsibility of the appropriate program or facility. The Safeguards and Security program conducts periodic inspections and evaluations of the facility safeguards and security systems to identify weaknesses and bring about their correction. Our program also provides international safeguards technical support to United States and international activities. The Department's personnel security investigations responsibility, which is an integral part of insuring adequate protection of resources and classified information, is also carried out through the Office of Safeguards and Security.

The Safeguards and Security program for which we budget directly supports both operational and developmental activities. Operational activities include the inspection and evaluation function, the improvement of protective forces training and capabilities, technical assistance to field operations, the Nuclear Materials Management and Safeguards System, and the New Brunswick Laboratory. Developmental activities that strengthen safeguards and security are carried out largely by the national laboratories and transferred to the Department's operations. We do not fund the actual plant, capital equipment and operating expenses of agency-wide safeguards and security systems at the Department's facilities. Rather, the safeguards and security systems in the weapons and nuclear materials programs and other Department programs are requested by, budgeted for, and implemented by those programs.

Within this framework and through the activities I will now address, we are endeavoring to achieve and maintain a reasonable level of protection for important Department activities, i.e., a prudent risk level.

The Nuclear Safeguards and Security program consist of five basic elements. These are: safeguards and security operations, technology, international activities, classification and program direction.

SAFEGUARDS AND SECURITY OPERATIONS

Addressing first the safeguards and security operations aspects of our program, I will cover field assistance in the implementation of safeguards and security improvements; security operations; the nuclear material control and accountability operation, which includes the Nuclear Materials Management and Safeguards System; and the New Brunswick Safeguards analytical laboratory at Argonne, Illinois.

Major efforts are required to assure that technology developed to date is transferred and incorporated into the Department's facilities throughout the country. Objectives are to assist operating contractors in applying state-of-the-art technology and cost-effective safeguards systems, and in training for effective operations. These field assistance efforts provide expert technical assistance for cost-effective application of advanced safeguards and security technology, and are focused on the integration of individual components, subsystems, and personnel into complete safeguards and security systems for the Department's facilities. Emphasis is being placed on protection against sabotage and theft of special nuclear material by both insiders and outsiders. To provide assurance that the systems are effective, the program includes use of comprehensive evaluation techniques. The program provides identification of several options in order that the site can select the appropriate option or combinations thereof for implementation based on performance tests, cost, environment, operational impact, and other site-specific considerations. A priority effort called the Safeguards and Security Improvement program is underway at the Department's production sites requiring improvements.

Current work aimed at improving our protective force capabilities will continue. We believe the continuation of tactical training, application of newly revised physical fitness requirements, and the realism and objectivity in our training exercises afforded by use of the MILES [Multiple Integrated Laser Engagement System] weapon systems provide for consistency and a high degree of excellence in guard force performance. Our protective force complement of more than 2,500 personnel will benefit from the major improvements in training and effectiveness evaluation.

The program will continue to provide the Department's field elements with timely intelligence information relating to current and changing threats to our activities. Through guidance and technology we will improve our capabilities to neutralize adversarial attempts to interfere with communications or to penetrate information processing systems.

We will continue to manage the comprehensive technical and psychological assessments of communicated threats. These evaluations are intended to provide timely operational judgments and recommendations to the Department's Emergency Action and Coordination Team, the U.S. Nuclear Regulatory Commission, the Federal Bureau of Investigation and other law enforcement agencies in real-time emergency situations involving malevolent threats to nuclear facilities or involving the use of nuclear materials.

Our Nuclear Materials Management and Safeguards System is the single national nuclear materials computerized data base for tracking the location of nuclear materials in the United States. Annually, approximately 700,000 nuclear material transactions, such as shipments, receipts, and inventory changes, from 130 contractors and 1,400 licensees are entered into the system.

We support the New Brunswick Laboratory, located at the Argonne National Laboratory, which serves as the U.S. Government's safeguards analytical laboratory providing materials and services to the Department, the Nuclear Regulatory Commission and other government agencies, and commercial, industry and foreign organizations. The measurements, standards and inventory verification services fulfill safeguards requirements essential for the control and accountability of nuclear and related materials.

SAFEGUARDS TECHNOLOGY

Research and development provides us with a base of technology to be used in safeguarding Department and other U.S. nuclear facilities. Included is a testing capability for new or modified commercial products, such as sensors and detectors, and analytical methods or capabilities for assessing safeguards and security weaknesses and specifying strategies for improvements. Efforts are directed toward the development and testing of new technology, components and systems for entry control, intrusion detection, explosives detection, use-denial, detection-surveillance-assessment for airborne threats, and advances in security systems to determine effectiveness against new or changing threats.

We coordinate these activities very closely with the research and development efforts of the Nuclear Regulatory Commission and Department of Defense in order to avoid duplication, and advanced technology is routinely transferred to the Department of Defense to assist them. We periodically explore the feasibility of joint research efforts that would be of mutual benefit.

INTERNATIONAL ACTIVITIES

Our international safeguards program supports U.S. nonproliferation and national security objectives. The requested level will permit continuation of the highest priority efforts. These include development of cost-effective international safeguards, which protect sensitive technology from compromise, for application in Gas Centrifuge Enrichment Plants (GCEP). This project includes prototype and onsite testing of the selected safeguards equipment. Safeguards equipment is being developed for International Atomic Energy Agency use at large nuclear fuel cycle facilities, including reprocessing, mixed-oxide fuel fabrication and nuclear power plants using plutonium fuel. Training is provided for foreign safeguards personnel from nations with developing nuclear programs, as directed by the Nuclear Nonproliferation Act of 1978. In addition, we are also actively engaged in exchanging safeguards information with certain countries and are working with trading partners to insure that U.S.-origin nuclear materials are adequately protected.

Compliance with international agreements and the Atomic Energy Act of 1954, as amended, requires the tracking of both U.S. materials exported overseas and materials of foreign origin in the U.S. We support the tracking of U.S. nuclear material in 50 countries, reporting to the International Atomic Energy Agency (IAEA) under the U.S./IAEA Safeguards Treaty, and determining inventories of nuclear materials under bilateral agreements. Under the Nuclear Nonproliferation Treaty our staff will continue to conduct joint physical security reviews with the Nuclear Regulatory Commission and the Department of State of U.S. materials exported to foreign countries.

CLASSIFICATION

Funds are included in this request for execution of the Department's program for policy development and implementation for classification of Restricted Data, Formerly Restricted Data, and National Security Information in accordance with the requirements of the Atomic Energy Act of 1954, as amended, and applicable Executive Orders. This program develops and maintains a system of classification guides and approves local classification guides issued by Department field offices and contractors. The program must also assure continuous review of Restricted Data in order for the Assistant Secretary for Defense Programs to determine what may be declassified and disseminated in the interest of science and technology and the general public welfare without damage to the national security. The authorization requested for the classification program in fiscal year 1984 is $1.15 million, $400,000 more than in fiscal year 1983. The increase is to continue work on establishment of an automated information retrieval system to provide for timely and consistent classification guidance.

SECURITY INVESTIGATIONS

Our program reimburses the Federal Bureau of Investigation and the Office of Personnel Management for conducting background investigations on DOE employees, contractor employees, and consultants prior to their being granted access to classified information or materials or to special nuclear materials. Background investigations are required by the Atomic Energy Act of 1954, as amended, and by Executive Orders 10450 and 10865 to ensure that granting access to classified information, classified material, or special nuclear material will not endanger the common defense and security.

Our budget request provides for approximately 16,700 full-field background investigations and 10,600 National Agency Checks. This is a decrease when compared to the current fiscal year. The majority of background investigations are in support of Defense Programs activities, but also included are Department and contractor personnel in the uranium enrichment and nuclear energy research and development, and other programs.

NUCLEAR SAFEGUARDS AND SECURITY FY 1984 AUTHORIZATION REQUEST ($ MILLIONS)

	FY 1983	FY 1984
OPERATING EXPENSES	$43.2	$48.0
CAPITAL EQUIPMENT	3.7	4.0
CONSTRUCTION	0.5	0
TOTAL NUCLEAR SAFEGUARDS AND SECURITY	$47.4	$52.0

SECURITY INVESTIGATIONS

	FY 1983	FY 1984
OPERATING EXPENSES	$28.5	$29.5

Mr. Chairman, we are requesting authorization of $52.0 million for the Nuclear Safeguards and Security Program which includes the classification effort and $29.5 million for the Security Investigations Program. With your continued support, we will continue to strive for improvements in the effectiveness of our safeguards and security program.

NUCLEAR MATERIALS PRODUCTION

Now, let us consider the Materials Production program.

The major objectives of the Materials Production program are to provide nuclear materials for National Defense requirements and for our allies under mutual defense agreements; to provide nuclear materials for agency reactor research and development programs, other government agencies, industry, and foreign governments under civilian agreements for international cooperation; and to receive and process nonproduction reactor fuels from the U.S. Naval propulsion reactors, research reactors, materials testing reactors, and various experimental reactors, for recovery of plutonium, enriched uranium, and other materials.

The primary products of our program are tritium and plutonium to meet U.S. nuclear weapons requirements as given in the Nuclear Weapons Stockpile Memorandum approved annually by the President. The fiscal year 1983–88 Stockpile Memorandum was signed by the President on November 18, 1982, and contains stockpile projections for planning purposes through fiscal year 1998.

The growth in the weapons production requirements shown here is due to the modernization of the United States nuclear weapons stockpile.

To accomplish our objectives, we operate major facilities at several DOE sites, including the production reactor feed plants at Fernald and Ashtabula, Ohio, and Oak Ridge, Tennessee; the N Reactor, a fuel fabrication plant, and site support facilities at Richland, Washington; three nuclear materials production reactors, two chemical processing plants, a fuel fabrication plant, and site support facilities at Savannah River, South Carolina; and a chemical processing plant and site support facilities at Idaho Falls, Idaho. Operations at Idaho include receipt, storage, and processing of fuels both from Navy propulsion reactors and government and civilian test reactors for the cost effective recovery and reuse of the remaining enriched uranium. A fifth production reactor, L Reactor at Savannah River, and a fourth reactor fuel processing plant, the PUREX facility at Richland, are planned to become operational in fiscal year 1984. Lawrence Livermore and Los Alamos National Laboratories conduct advanced research and development activities for the production program.

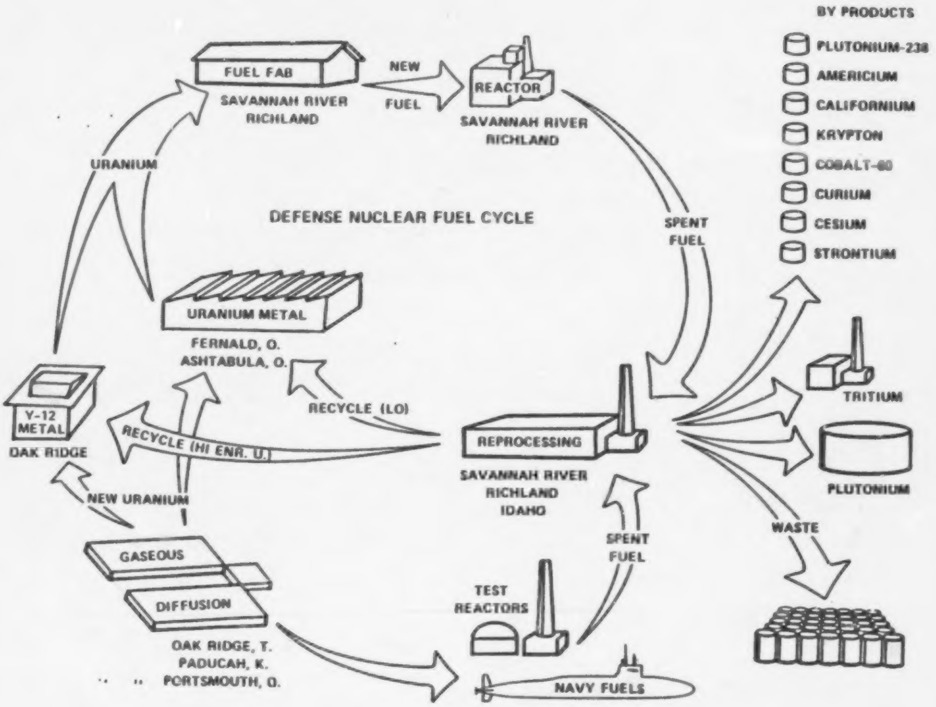
These sites comprise an estimated 1,850 square miles of land area and employ about 14,000 personnel. The facilities at these sites are unique to the production of nuclear materials for defense purposes. There is no cost effective alternative method available for producing nuclear materials required by the national defense program.

PRODUCTION PROCESS AND MATERIAL FLOW

For the nuclear weapons program, we produce plutonium and tritium in our production reactors. The N Reactor at Richland, Washington is used to produce plutonium. The Savannah River reactors are used to produce both plutonium and tritium.

The Savannah River reactors use uranium enriched about 60 percent in the isotope uranium-235 in the fuel rods to drive the reactors. Physically separate depleted uranium-238 targets capture neutrons to make plutonium. The depleted uranium target rods are subsequently chemically processed at Savannah River to recover the plutonium. Tritium is produced in lithium loaded target rods which are placed in the reactor in lieu of the depleted uranium rods. These lithium targets also capture neutrons to produce tritium and helium. [Deleted.]

The N Reactor on the Hanford site at Richland uses slightly enriched uranium fuel containing about 1 percent fissile uranium-235 to fuel the reactor and to produce plutonium. The spent fuel from N Reactor is now being stored in water-filled concrete basins at the reactor site pending scheduled reactivation of the Hanford PUREX fuel processing plant in April 1984.


BY PRODUCTS
PLUTONIUM-238
AMERICIUM
CALIFORNIUM
KRYPTON
COBALT-60
CURIUM
CESIUM
STRONTIUM
FUEL FAB
SAVANNAH RIVER
RICHLAND
NEW
FUEL
REACTOR
SAVANNAH RIVER
RICHLAND
URANIUM
DEFENSE NUCLEAR FUEL CYCLE
SPENT
FUEL
URANIUM METAL
FERNALD, O.
ASHTABULA, O.
TRITIUM
Y-12
METAL
OAK RIDGE
RECYCLE (LO)
RECYCLE (HI ENR. U.)
REPROCESSING
SAVANNAH RIVER
RICHLAND
IDAHO
PLUTONIUM
NEW URANIUM
WASTE
SPENT
FUEL
GASEOUS
DIFFUSION
TEST
REACTORS
OAK RIDGE, T.
PADUCAH, K.
PORTSMOUTH, O.
NAVY FUELS

The defense nuclear fuel cycle is depicted on this chart. The enriched uranium to fuel our reactors comes from four sources: (1) slightly enriched and highly enriched uranium that is recovered from the reactor fuel itself after it has been irradiated in the production reactors; (2) highly enriched uranium, recovered from spent Navy and R&D reactor fuels, that are processed at Idaho or Savannah River; (3) highly enriched uranium that is stockpiled at the Oak Ridge Y-12 plant; and (4) slightly enriched uranium from the gaseous diffusion plants. Oak Ridge provides uranium of the proper enrichment level for the reactors and ships it to Savannah River or Richland where it is fabricated into fuel for use in the reactors.

NUCLEAR MATERIAL REQUIREMENTS

[Deleted.] Most of the nuclear materials required for building new warheads is obtained by reclaiming and recycling existing materials from retired weapons which are returned by the Department of Defense to DOE. However, weapon requirements which cannot be met from Department of Defense returns or existing DOE inventories must be satisfied by new production. [Deleted.]

Our first materials priority is the production of tritium. Tritium is an indispensable material [deleted] and, due to its natural radioactivity, is constantly decaying at a rate of about 5.5 percent per year. It is vitally important to our nuclear deterrent capability [deleted].

Even if there were no requirement to produce plutonium, we would still need to produce tritium to maintain our weapon stockpile.

[Deleted.]

[Chart deleted.]

This chart shows how the demand for plutonium equivalent for the current Stockpile Memorandum will be met.

[Deleted.]

NUCLEAR MATERIALS PRODUCTION ACTIVITIES

To produce the material required to meet the Stockpile requirements we are following several courses of action. We will continue to produce the majority of the material to meet requirements in our three currently-operating reactors at Savannah River, N Reactor at Richland, and L Reactor at Savannah River, which is scheduled to be restarted in October 1983. Also, blending of high-purity plutonium with supplies of existing fuel-grade plutonium and the use of high productivity Mark 15 cores are important production initiatives to meet requirements. In addition, in the longer term, plutonium isotope separation technology and a New Production Reactor will be needed to meet projected requirements. These activities, along with our other initiatives, will be discussed in the following sections.

NUCLEAR MATERIALS PRODUCTION
FY 1984 BUDGET REQUEST
BUDGET SUMMARY
(IN MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
BASE	$ 793.2	$ 838.7	$1,028.9	$1,042.9
PRODUCTION INITIATIVES				
RESTORATION	26.0	122.1	133.8	133.8
L REACTOR UPGRADE	43.0	60.5	73.5	73.5
PUREX FUEL PROCESSING REACTIVATION	64.4	67.1	82.9	82.9
HIGH PRODUCTIVITY CORES	18.7	18.7	68.3	68.3
SPECIAL ISOTOPE SEPARATION	68.8	76.0	51.9	51.9
NEW PRODUCTION REACTOR	2.0	2.0	5.0	5.0
REACTOR SAFETY	7.2	16.2	8.6	14.6
SECURITY PROJECTS	0	1.5	0.4	12.4
	$1,023.3	$1,202.8	$1,453.3	$1,485.3

BASE ACTIVITIES

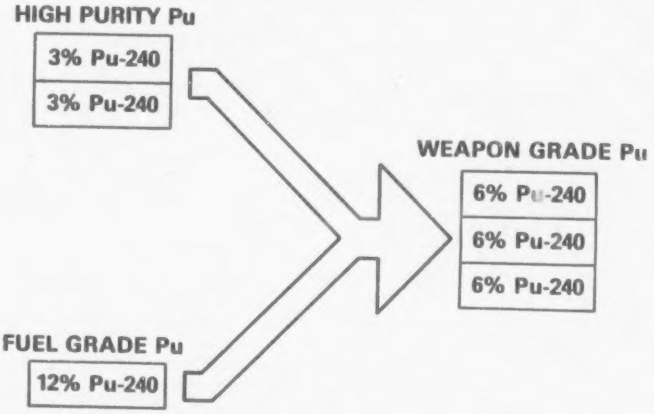
Base activities are those ongoing efforts required to meet the objectives of the program. Base activities include: operation of three Savannah River reactors to produce high-purity plutonium and tritium; operation of the Richland N Reactor to produce weapon-grade plutonium; operation of two processing facilities at Savannah River and one at Idaho; operation of reactor fuel fabrication facilities at Oak Ridge, Richland, and Savannah River; reactor security improvements, including implementation of a rapid material accounting system; increased maintenance of the Savannah River reactors such as P Reactor turbine repairs, and of the Savannah River and Idaho processing facilities; and productivity improvements at N Reactor. The base program also supports processing of the Naval and R&D reactor spent fuel returns in Idaho, recycling scrap nuclear materials to minimize new production needs and supporting other DOE and industry requirements. Considerable funding is required for maintenance and equipment replacement to operate these aging facilities in a safe, secure, and environmentally-acceptable manner.

For the first time, the Materials Production budget includes uranium enriching costs for the slightly enriched uranium needed to fuel N Reactor. In prior years, this material was obtained from existing inventories. In fiscal year 1984, however, the proper assay will no longer be in inventory.

The blending program is one of the initiatives started in fiscal year 1981 and is considered part of our base activities. Blending of high-purity plutonium (3 percent Pu-240) produced at Savannah River with existing fuel-grade plutonium (12 percent Pu-240) from Richland is the most cost-effective means we have available to us for increasing the near-term supply of weapon-grade plutonium. Blending results in about a 50 percent increase in weapon-grade plutonium production compared to producing weapon-grade plutonium directly.

DEFENSE PROGRAMS — NUCLEAR MATERIALS

BLENDING



Since a large DOE inventory of fuel-grade plutonium exists, blending is an attractive method of increasing weapon-grade plutonium production while a plutonium isotope separation capability is being developed. [Deleted.]

During fiscal year 1984, the first plutonium from the Purex facility will be received and blended at Savannah River.

PRODUCTION INITIATIVES

Restoration

The Restoration Program is being undertaken to improve the reliability and efficiency of the materials production complex. Most of the production complex has been in continuous use for 25 to 30 years. As a result of aging and use, many facilities, systems, and components have gradually worn out, deteriorated, or become obsolete, causing a decrease in production capability and efficiency.

By 1978 the magnitude of this problem had increased to the point of causing both DOE and Congressional concern. A study was directed at that time to determine what measures were required to restore the production complex to a previous level of productivity and a plan was submitted to Congress in 1979 covering the implementation of all needed corrections. Initial funding of this program, which does not include the Idaho Fuel Processing Facility, was begun in fiscal year 1981.

Restoration construction activities are divided into five authorization phases. Initial funds were provided for Phase I in fiscal year 1981, Phase II in fiscal year 1982, and Phase III in fiscal year 1983. In fiscal year 1984 we will continue this earlier work and initiate Phase IV. This includes funds to complete: replacement of the obsolete plutonium-238 facilities at Savannah River, N Reactor restoration work at Richland, and reactor fuel handling safety improvements at Savannah River. Phase IV covers additional restoration work required at Savannah River and includes replacement of both reactor and production support equipment. New subprojects will also be added to restore the stoker powerhouses which supply steam and electricity needed for production operations, and modify the Radiological Support Facility which conducts necessary environmental and health analyses. Continued support of this restoration program is vital, since we cannot achieve our production goals without a reliable production complex.

L reactor upgrade

The program to upgrade L Reactor was initiated in fiscal year 1981. This upgrading is currently on schedule for completion in fiscal year 1983. Fiscal year 1984 will be the first full year of operation of L Reactor. Since the L Reactor was shut down in 1968, many capital projects have been completed to improve the safety and efficiency of the three operating reactors at Savannah River. These changes are being incorporated into L Reactor to bring it to a condition at startup that is equivalent to that of the operating reactors. [Deleted.]

Purex fuel processing reactivation

The fiscal year 1984 budget provides for the funding to continue up to a half year of reactivation activities of the Purex fuel processing plant and its supporting facilities at Richland, and for a half year of operation. Purex reactivation is planned for April 1984. [Deleted.] We are making every effort to begin Purex processing as early in fiscal year 1984 as possible. This activity is ahead of schedule and earlier startup appears feasible. Purex will be used to process irradiated fuel from N Reactor which has been stored since 1972. The stored fuel contains both weapon-grade and fuel-grade plutonium.

High productivity Mark 15 cores

The Mark 15 program uses slightly enriched uranium fuel in the Savannah River reactors to provide a uniform core loading that has the potential for significant near-term increases in the level of plutonium production. Our request provides funding to prepare for the conversion of one Savannah River reactor to the Mark 15 mode of operation for part of fiscal year 1985. It also includes funds for the purchase of slightly-enriched uranium from the gaseous diffusion plants for the Mark 15 fuels. Other activities include completion of additional facilities at Savannah River to store Mark 15 fuel and initiating production of Mark 15 fuel at Fernald and Savannah River.

[Deleted.]

Special isotope separation

The fiscal year 1984 budget request allows for continuation of the plutonium Special Isotope Separation program. Our fiscal year 1984 request is below our fiscal year 1983 authorization. The decrease reflects the Administration's assessment that a somewhat longer period of research and development is needed before the construction of a demonstration facility. It will enable Lawrence Livermore and Los Alamos National Laboratories to continue experiments begun in fiscal year 1982, will support a demonstration of plutonium isotope separation technology on a prototype scale in fiscal year 1986, and will enable the production site to complete the preliminary design of the facilities and equipment needed for a plutonium pilot facility [deleted].

New production reactor

The New Production Reactor will eventually be required to assure the production of tritium that is so vital to maintaining our nuclear weapon stockpile. It will primarily be needed to ensure the availability of tritium during the late 1990's and into the next century. Tritium is presently produced in our Savannah River reactors, which are now about 30 years old. We believe it is prudent to design and build a new reactor, as there is an increasing probability over time that the Savannah River reactors could become unuseable. In the decade it will take to design and construct a new production reactor, the Savannah River reactors on which we now depend for tritium will become more than forty years old. The Hanford N Reactor will have to be shut down in the mid-1990's due to distortion of the graphite core. The new reactor would provide reliable tritium production as well as the capability to produce other reactor materials well into the next century. Our fiscal year 1984 budget request provides for activities to support an initial safety review, site characterization, and technology verification activities.

REACTOR SAFETY

Funds are requested to continue activities initiated in fiscal year 1981 to improve the operating safety of our production reactors at Savannah River and Richland. Our objective is to reduce the probability of accidents, enhance safety operations, and improve our capability to manage emergency conditions. Work that will continue in fiscal year 1984 includes increased reactor operator training activities and for modifications to the production reactors to reduce the risk of accidents. Also, at Savannah River, it will provide for construction of a reactor simulator.

SECURITY PROJECTS

We are planning to continue a construction project to improve the security at N Reactor at Richland. We are also continuing two other projects to improve the security of our production reactors at Savannah River and of the Idaho Fuel Processing Facility at the Idaho National Engineering Laboratory.

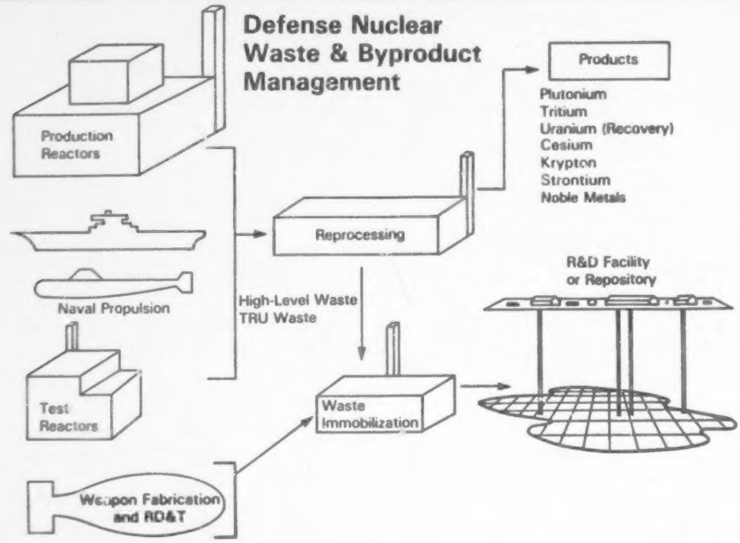
At Richland, our requested funding for the N Reactor Security and Surveillance project (82-D-118) will provide for completion of Title I and II design, [deleted]. This project is planned to be completed in fiscal year 1985. For the Savannah River Safeguards Improvements project (82-D-127), our requested funding provides for the completion of modifications [deleted]. This project is scheduled for completion in fiscal year 1986. [Deleted.]

Now, Mr. Chairman, I would like to turn to the Defense Waste and Byproducts Management Program.

DEFENSE WASTE AND BYPRODUCTS MANAGEMENT

The Defense Waste and Byproducts Management program provides for the management of radioactive wastes generated primarily by the Department's defense activities for the nuclear navy, and for the necessary production of nuclear materials and weapons justified in the testimony on behalf of these other programs. It also includes the development of technologies and facilities for disposal of high-level and transuranic waste from defense activities.

The goal of the Defense Waste and Byproducts Management program is to utilize or dispose of defense nuclear waste routinely, safely, and effectively. In June of this year, the President will forward to the Congress our plans for permanent disposal of high-level and transuranic waste in response to Public Law 97-90. It will show a reasonable and affordable way to meet this goal. By careful evaluation of risks and benefits and through technology improvements, we have reduced the cost of this program dramatically from previous estimates. This reduction in the estimated funding for defense waste management will make more resources available for national needs.



Defense Nuclear Waste & Byproduct Management

We are managing the waste safely pending its disposal. The program we propose for fiscal year 1984 continues that job and more: the two major remaining gaps in the defense waste program, demonstration of geologic disposal and immobilization of high-level waste as shown here, are addressed by the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, and by the Defense Waste Processing Facility (DWPF) at Savannah River, South Carolina. With our fiscal year 1984 funding request, both projects will be under full construction with operations planned for the late 1980's. These facilities will demonstrate effective means for disposal of defense waste and will provide knowledge and experience upon which future defense and commercial programs can build. We expect that by maximizing the utilization of existing facilities and pilot plants, WIPP and DWPF along with a permanent repository will be the only major capital facilities currently required to permanently dispose of defense waste. Having cut the defense waste tasks down to size, we recommend that these two facilities be constructed as proposed. They will get the job done safely and effectively.

BYPRODUCTS UTILIZATION

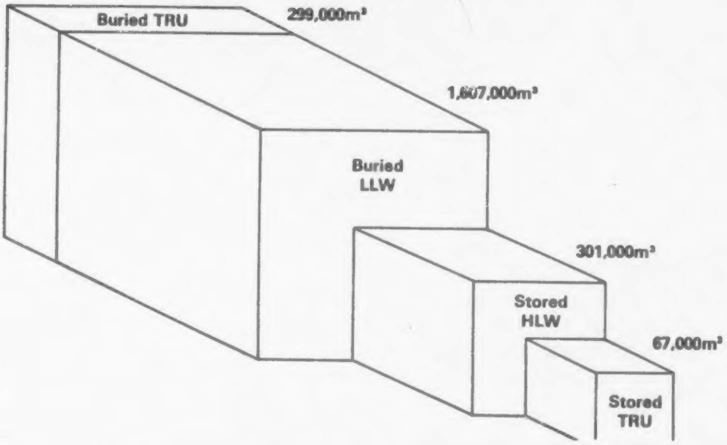
We will continue to recover, or retain the option to recover, byproducts for safe and cost-effective beneficial uses. This recovery can make the management of the remaining waste materials much easier to deal with. For example, we have separated cesium and strontium from the high-level waste at Hanford which allows the remaining waste to go to uncooled storage tanks. At Savannah River, the recovery of strategic noble metals with an estimated value of $30 million will continue to be pursued in the Defense Waste Processing Facility at no cost to that project. In the same project, we also expect to recover and recycle 90 tons of mercury from high-level waste and thus will not have to buy more mercury for production operations at Savannah River. We also plan to recover valuable materials from low-level waste and return them for productive use. For example, at Idaho we can smelt contaminated steel for reuse. We will continue to provide the Department of Defense with self-luminous lighting and long-lived, secure power supplies. Funding from prior years will allow us to demonstrate to the civilian sector that sewage sludges can be treated with radiation, without introducing any residual radioactivity, and used as fertilizers and even as a food supplement for cattle. Similarly, food can be sterilized without introducing the slightest trace of residual radioactivity. This technology is ready for transfer to the private sector.

REGULATIONS

We are supporting the Environmental Protection Agency and other regulators in developing rational criteria and standards for nuclear waste management, based on real hazards rather than on perceptions or fears, so that we may not waste our efforts but concentrate on the real problems. The Defense Waste and Byproducts Management program will continue to protect workers, public health and safety, and the environment. Our waste management directives comply with the law and provide a level of protection equivalent to Nuclear Regulatory Commission regulations.

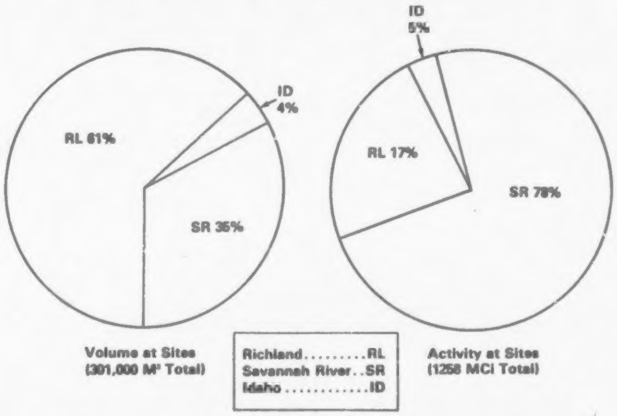
WASTE INVENTORIES

Defense Waste Inventory
(As of 12/31/81)



This drawing illustrates the inventories of defense waste. The fuel cycle is closed for the largest inventory, low-level waste, through shallow-land burial.

DOE DEFENSE HIGH-LEVEL WASTE INVENTORY STORED IN UNDERGROUND TANKS (12/31/81)

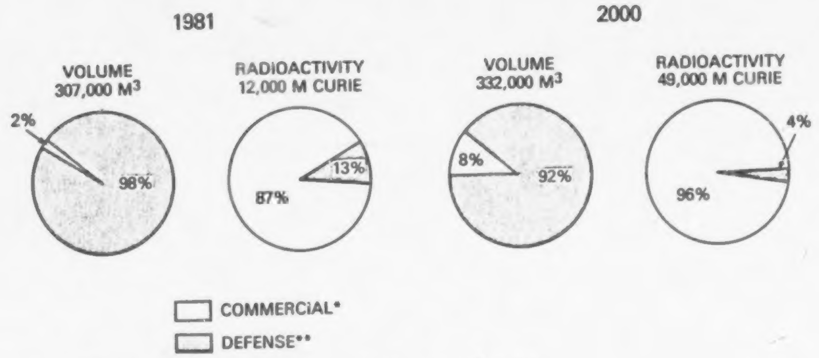


Volume at Sites (301,000 M³ Total)

Activity at Sites (1258 MCi Total)

This illustration shows that 61 percent of the volume of high-level waste, but only 17 percent of the radioactivity, is in the Richland tanks, while 35 percent of the volume and most of the radioactivity is at Savannah River.

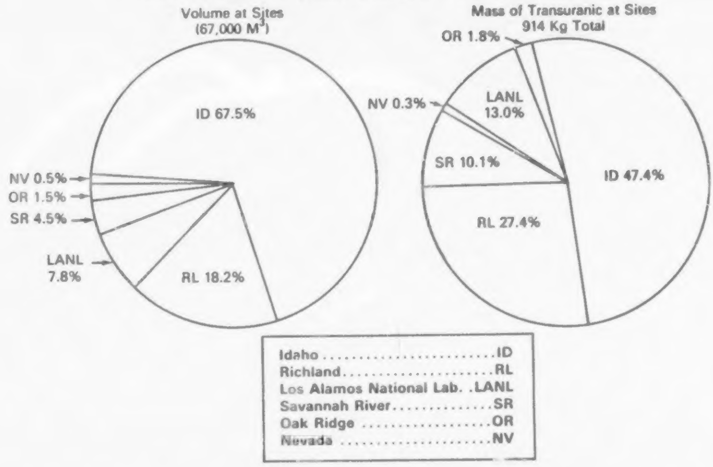
HIGH LEVEL WASTE INVENTORY (12/31/81)



* INCLUDES SPENT FUEL AND ASSUMES REPROCESSING STARTS IN 1989
** ASSUMES DWPF STARTS IN 1990

Here, we compare the volumes and radioactivity of defense waste with commercial waste. The radioactivity of commercial waste is much greater and much more concentrated than the more dilute defense waste. This trend will continue as indicated on the chart.

DOE DEFENSE TRANSURANIC STORED WASTE INVENTORY (12/31/81)



These pie charts show that most of the stored transuranic and suspect transuranic wastes, by volume and transuranic content, are at Idaho. Our efforts to dispose of defense waste are concentrated initially on high-level waste at Savannah River and on transuranic waste at Idaho.

The following will describe some recent accomplishments and the plans for fiscal year 1984. I will follow the budget structure as on this Chart.

DEFENSE WASTE AND BYPRODUCTS MANAGEMENT
FY 1984 BUDGET REQUEST
(BA IN MILLIONS)

	FY 1983		FY 1984	
	AUTH.	APPROP.	AUTH.	APPROP.
INTERIM WASTE OPERATIONS	$264.3	$285.0	$307.4	$317.0
LONG-TERM WASTE MANAGEMENT TECHNOLOGY	101.3	106.3	211.3	211.3
(DEFENSE WASTE PROCESSING FACILITY)	(46.0)	(46.0)	(154.6)	(154.6)
TERMINAL STORAGE (WIPP)	90.6	125.4*	141.1	80.7
PROGRAM DIRECTION	2.0	2.0	2.5	2.5
TOTAL	$458.4	$518.7	$662.3	$611.5

* INCLUDES $50 MILLION PROPOSED FOR DEFERRAL UNTIL FY 1984.

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INTERIM WASTE OPERATIONS

The principal objective of this program is to manage existing and newly-generated waste from defense production operations pending implementation of long-term disposal. During fiscal year 1982, the transfer of high-level waste from old tanks to new tanks continued at the Hanford Reservation and the Savannah River Plant. At Hanford, an additional 8 tanks were isolated from the environment and 20 more tanks will be isolated in fiscal year 1983 for a total of 42 out of 149. The program will be completed in fiscal year 1989.

Improvements in the waste transfer program at Savannah River promise to save significant amounts of money in the long-term. Sludge processing in the tank farm was successfully demonstrated in 1982. This has reduced the cost of the Defense Waste Processing Facility by about $200 million. Salt decontamination in the tank farm will be demonstrated in fiscal year 1983. If successful, it will save over $500 million in construction costs for what would have been Phase II of the Defense Waste Processing Facility.

Radionuclides removed from the salt, such as cesium, have potential beneficial uses. The waste transfer program will be completed in fiscal year 1994, which reflects a three year stretchout to effect a more efficient interface between waste preparation in the tank farm and feed requirements in the Defense Waste Processing Facility.

The New Hydrofracture Facility at Oak Ridge was completed in fiscal year 1982 and began to inject a mixture of intermediate-level waste and concrete into the shale formation under the site. About 350,000 gallons of waste from research programs dating back to the Manhattan Project, will be disposed of in 1983.

At the Idaho National Engineering Laboratory, the New Waste Calcining Facility started up in September 1982. This facility converts liquid high-level waste into a granular solid, called "calcine," for interim storage in bins. The New Waste Calcining Facility is a critical element of the fuel processing operation at Idaho since there is no significant capacity for lag storage in our facility there. In about six months of operation, the equivalent of one full tank (about 300,000 gallons) of liquid has been solidified, about 17 percent ahead of schedule. The construction of the sixth set of storage bins for calcine, also necessary to insure continuity of productive operations, is on schedule.

As I mentioned previously, we will also be investigating in fiscal year 1983 the feasibility of converting more waste streams into beneficial byproducts. At Oak Ridge, we are considering the cost-effectiveness of smelting almost 100,000 tons of contaminated scrap metal into shielding blocks for use at several of the Department's high energy accelerator facilities. At Idaho, we are evaluating contaminated steel to see if it can be smelted and fabricated into canisters for the immobilized high-level waste from the Defense Waste Processing Facility.

WASTE VOLUME REDUCTION

Waste volume reduction is an important element of the Interim Waste Operations Program because it extends the lifetime of storage and disposal facilities and delays the need for new facilities required to support production operations. At Savannah River, for example, our goal for fiscal year 1983 is to gain seven million gallons of high-level waste storage, the equivalent of about six new tanks, through evaporation. This activity is ahead of schedule. At Hanford, we have accelerated evaporator operations with the goal to free two million gallons of tank space to support PUREX reprocessing operations, which will begin in 1984.

Solid waste volume reduction operations will continue to reduce the need for new burial ground facilities at all of our sites. Segregation and examination of transuranic waste can reduce the amount which must be stored, certified, and eventually transported to and emplaced in the Waste Isolation Pilot Plant. The first quantities of waste were certified for emplacement in early fiscal year 1983. Funds invested in these volume reduction and waste segregation activities will pay off in decreased requirements for disposal and storage facilities and their related operating, closure, and long-term maintenance and surveillance costs. The development and demonstratio of waste volume reduction techniques will continue.

The solidification and encapsulation of strontium and cesium at Hanford has made good progress. Our goals for fiscal year 1983 are to produce 70 additional strontium capsules (for a total of 350 out of 660 planned), and to encapsulate the entire backlog of cesium by the end of fiscal year 1983 for a total of 1680 capsules.

In fiscal year 1984, we will continue safe and environmentally acceptable waste activities and support for increased production operations. The transfer of high-level waste from old to new tanks will continue at Savannah River and Hanford. The construction of the sixth set of storage bins for calcine will continue at Idaho with a scheduled completion in December 1984. The construction of eight new double shell tanks begun in fiscal year 1983, and the solidification and encapsulation of strontium from high-level waste, will continue at Hanford. Our goal is to complete the encapsulation of the entire backlog of strontium by 1986 (a total of 660 capsules planned) for safer storage and for potential beneficial use.

During fiscal year 1984, we will also continue to dispose of low-level waste and to store transuranic waste retrievably. We are continuing to prepare for the time when operations at the WIPP will begin. We will complete the development and implementation of procedures to examine newly generated transuranic waste and to certify that it is acceptable for emplacement in the WIPP. Certified waste will be stored separately.

LANDLORD RESPONSIBILITIES

Under our landlord responsibilities, we will continue efforts, begun in fiscal year 1983, to restore badly deteriorated general support facilities and equipment to an acceptable standard of safety, reliability and efficiency. Our goal is to complete the "facilities restoration" part of our landlord responsibilities at Hanford in fiscal year 1988. We are also continuing to support the maintenance, repair and replacement of general site support facilities, such as utilities, roads and service buildings, under our Idaho landlord responsibilities which we assumed in fiscal year 1983.

DECONTAMINATION AND DECOMMISSIONING

The Interim Waste Operations program is responsible for about 400 surplus defense facilities, including reactors, reprocessing plants, and waste management facilities. We emphasize the safe management of these facilities, stressing beneficial reuse of structures, recovery of valuable materials, and reduction of future maintenance costs. In fiscal year 1983, for example, the Curium Facility at Oak Ridge National Laboratory, originally scheduled for decommissioning in fiscal year 1981, was instead decontaminated and refurbished for use in the production of defense nuclear materials. Reuse of this facility resulted in a savings of about $10 million to the taxpayer in new construction costs.

For fiscal year 1984, we will continue to provide surveillance and maintenance of all surplus defense facilities and continue high priority decommissioning work at Idaho, Mound Facility, New Brunswick Laboratory, Oak Ridge National Laboratory, and Hanford with particular emphasis on facility re-use and recovery of valuable materials.

LONG-TERM WASTE MANAGEMENT TECHNOLOGY

This program addresses the long-term management and disposal of defense wastes. The President's plan for permanent disposal of defense high-level and transuranic waste is being drafted and will be implemented under this program.

HIGH-LEVEL WASTE

We are developing the technology for the long-term management of defense high-level waste at DOE sites with emphasis on the Defense Waste Processing Facility at Savannah River. In fiscal year 1983, the work on alternative waste forms was completed and borosilicate glass was selected as the waste form for the facility. The Department has complied with the National Environmental Policy Act regarding the Defense Waste Processing Facility project.

DEFENSE WASTE PROCESSING FACILITY

During fiscal year 1984, we will perform large-scale tests with simulated waste to demonstrate the reliability of the Defense Waste Processing Facility systems, including slurry feed, off-gas, and process controls. Smaller scale tests with actual high-level waste from the Savannah River Plant will continue in hot cells. Together, these tests will assure that the Defense Waste Processing Facility will work as designed. We will also describe and document the predicted behavior of the glass waste form in a geologic repository.

This facility will immobilize defense high-level waste at Savannah River for storage, transportation, and disposal in a geologic repository offsite. The sludge fraction of the high-level waste, which contains most of the hazardous radionuclides and virtually all of the long-lived activity, will be immobilized directly after extracting mercury. The activity in the soluble salt fraction, primarily radioactive cesium, will be separated and can be used as a beneficial byproduct, possibly in an immobilized form. When the DWPF is operational in fiscal year 1989, we will begin to work off the backlog of high-level waste from production operations at Savannah River, reaching the steady-state operation in about 15 years.

The design, begun in fiscal year 1979, will continue in fiscal year 1983. Major construction activities will begin early in fiscal year 1984, and hot operation in fiscal year 1989. We are requesting authorization of $154.6 million for the DWPF, in fiscal year 1984. This is required to continue design and to enter into subcontracts for excavation, main process building construction, major equipment, construction materials and construction support. The total estimated cost for the DWPF is $910 million, a reduction of $60 million from last year's estimate. This reduction is due mainly to lower inflation estimates and can be sustained if authority is available to enter into major construction subcontracts in fiscal year 1984. If this is done, and if inflation continues to abate, we hope to reduce the total cost even further.

TRANSURANIC WASTE

This program focuses on supporting the Waste Isolation Pilot Plant. The first priority is to certify newly generated waste for the pilot plant if it meets the acceptance criteria. This reduces the growth in the backlog of stored waste that requires examination before it can be sent to the Waste Isolation Pilot Plant or processed for it. Second, the inventory of "old" stored waste will be examined and certified or processed consistent with the Waste Isolation Pilot Plant schedule.

In Idaho, we are completing the final designs for two pilot plants in fiscal year 1983—the Stored Waste Examination Pilot Plant to examine and certify stored waste containers for the Waste Isolation Pilot Plant; and the Processing Experimental Pilot Plant to demonstrate processes for treating stored waste containers that do not meet the Waste Acceptance Criteria. We will also begin testing a new prototype transportation system for transuranic waste and continue to support the certification of contact-handled transuranic waste versus the Waste Acceptance Criteria at all sites.

In fiscal year 1984, we will begin construction on each of the two pilot plants. We will also complete the design and qualification of a canister for remote-handled transuranic waste and begin certifying remote-handled waste, using that canister, by the end of the fiscal year.

We will start operation of a waste treatment process at the Rocky Flats Plant that will significantly reduce both the sludge volume and the cost of managing that waste.

LOW-LEVEL WASTE

The Low-Level Waste Technology Program supports waste operations at DOE sites. In fiscal year 1983, the technical basis for the DOE Order for waste managment operations will be documented. A handbook will document the waste treatment technologies for use by the operators of facilities.

In fiscal year 1984, handbooks are to be developed to document improved practices and procedures for shallow-land burial sites including our experience with barriers against water infiltration and biological intrusion. Corrective measures for old shallow-land burial sites will be documented in a separate handbook.

AIRBORNE WASTE

The Airborne Waste program supports DOE operations in controlling and disposing of gaseous and particulate emissions. In fiscal year 1983 final reports on carbon-14 immobilization, electrofibrous prefilter development, and removal of volatile fission products by thermal outgassing will be completed.

This program will be completed in fiscal year 1984. Final reports on real-time effluent monitoring systems and laboratory support of the High Energy Particulate Air Filter Test Facilities will be prepared.

BYPRODUCTS UTILIZATION

We are demonstrating several beneficial uses of byproduct materials. In fiscal year 1983, we will complete the design and begin construction of the 33 ton per day cesium-137 sludge irradiator in the City of Albuquerque, New Mexico.

Tests and evaluations of remote airfield tritium lights under arctic conditions were successfully completed in January 1983. The Department of Defense Rapid Deployment Force has expressed particular interest in the use of light-weight, infrared tritium markers in establishing forward tactical attack bases.

During fiscal years 1983 and 1984 (with prior year funds), we will transfer, where possible, the technology of cesium-137 irradiation of sewage sludge and food; self-luminous lighting with tritium and krypton; secure power for strategic and remote applications with strontium-90; and the recovery of noble metals with strategic significance to the private sector. Future efforts will be funded by users of the byproduct materials.

TRANSPORTATION RESEARCH AND DEVELOPMENT

This program seeks to assure that safe, efficient, and reliable transportation will be available for defense nuclear wastes. Technology development, testing, and operational safety and accident analysis are conducted at the Transportation Technology Center at the Sandia National Laboratory in Albuquerque, New Mexico.

In fiscal year 1983, an instrumented prototype of a new, truck-mounted, transporter [Trupact] for contact-handled transuranic waste will be fabricated and tested under regulatory hypothetical accident conditions. Orders for long lead time materials for additional prototype transporter units will be placed in fiscal year 1983. The preliminary design of a new high-level waste cask for trucks will be completed and a prototype unit of a new cask for trucks will be completed and a prototype unit of a new cask for transport of cesium and strontium capsules from Hanford will be fabricated. This cask will support the use of cesium for irradiation of sewage sludge.

In fiscal year 1984, prototype Trupact units will be fabricated and an operational demonstration initiated. The high-level waste cask final design will be completed, a cask model fabricated and tested, and a prototype cask fabricator selected. The first production unit of the new cask for cesium and strontium capsules will be delivered and made available for use. We will continue research, development, testing, and evaluation of nuclear materials transport systems to meet the Department's requirements. We will evaluate the impacts of regulatory changes at the Federal, State, and local levels, develop standards for packaging, and maintain data bases on shipments, incidents, routing, emergency response, and state and local legislation. DOE's Albuquerque Operations Office will continue to be the lead organization for this program.

TERMINAL STORAGE—WASTE ISOLATION PILOT PLANT

The Waste Isolation Pilot Plant project is being developed as a research and development facility to demonstrate the safe disposal of radioactive wastes from national defense programs. The project is exempted from licensing by the Nuclear Regulatory Commission.

The exploratory phase of construction is nearly complete. It includes drilling two deep shafts and extensive exploratory mining at the 2,150 foot level to assess the suitability of the site for radioactive waste disposal. A site validation report will be issued by late March 1983. Construction of permanent surface and underground facilities could start in the summer of 1983, assuming timely receipt of administrative land withdrawal authority from the Department of the Interior.

On December 27, 1982, the Department signed a Supplemental Stipulated Agreement with the State of New Mexico. This Agreement resolved the remaining issues under the State's lawsuit on the project. These issues included transportation monitoring, emergency response preparedness, environmental monitoring, State liability, and highway repair. Good relationships with the State will be a key factor in continuing construction on schedule.

The administration is supporting the Waste Isolation Pilot Plant project with a fiscal year 1984 authorization request for $141.1 million.

During fiscal year 1984 we expect the Architect-Engineer to complete the design for the pilot plant project. Construction will be nearly at its peak effort. Significant facilities will be completed, including the waste handling shaft, 31 miles of water pipeline, and water storage tanks. The primary waste handling building will be started and extensive underground development will take place. Assuming all project activities continue on schedule, the WIPP facility will be ready for emplacement of radioactive waste in 1988.

SUMMARY

This completes my statement on the DOE's Defense Programs. I will be pleased to answer any questions the committee may have.

[A brief recess was taken.]

Senator **WARNER**. We will now resume the hearing. I would like to again extend my apologies. Most of you have been before the Congress many times, so you know the scheduling complexities of the situation. I hope that my absence and the absence of others in no way detracts from what we regard as this most important hearing and the work that you do and the effort you undertake to come and present your annual budget.

Dr. Batzel, will you lead off?

STATEMENT OF DR. ROGER E. BATZEL, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. **BATZEL**. I am pleased to be here again this year. Last year when I appeared before this committee, I discussed a number of defense related issues:

First, our nuclear weapons program.

Second, inertial confinement fusion.

Third, the special isotope separation.

Fourth, just a brief statement of the Soviet weapons technology.

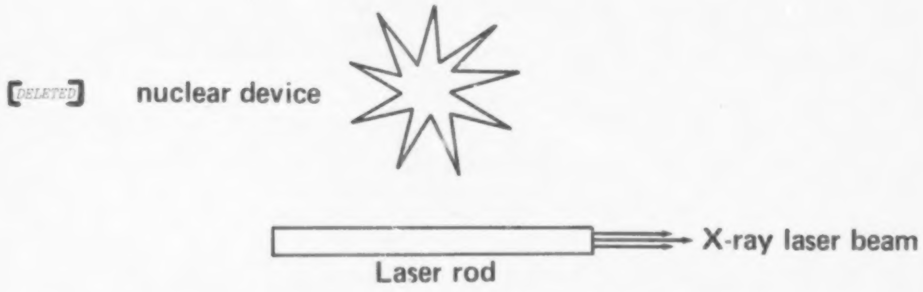
This year in particular I want to talk about the achievements that we have made and our accomplishments in the pursuit of directed energy weapons which, I think, relate in a way we can't define today to the President's request that the scientific community look at ways of improving defense systems. I view the President's request as a positive one.

The issue of trying to push offensive systems further and further seems to be a difficult one, a very unrewarding one. It is not clear to me whether by technology we can solve the ballistic missile defense problem or not. I think there is a chance. The kinds of ideas that we are pursuing today are particularly suited to that kind of defense application. [Deleted.]

[A slide presentation.]

[Deleted.]

[DELETED]



The concept, as indicated on this slide, shows the nuclear explosive driving a laser rod. What you get then is an intense burst of X-rays [deleted] which then can be targeted on an object in space.

[Deleted.]

Senator Warner. [Deleted.]

Dr. Batzel. [Deleted.]

Senator Warner. [Deleted.]

Dr. Batzel. [Deleted.]

Senator Warner. [Deleted.]

Dr. Batzel. [Deleted.]

Senator Warner. [Deleted.]

Dr. Batzel. [Deleted.]

[Chart deleted.]

Senator Warner. The problem that the subcommittee has is as follows: We held a hearing today on which the President included in his speech reference to the general category of weapons. Not one single reference to any dollars or accelerated program was made. Then the speech came. No reference to anything. Now we see a chart with an accelerated pace. Was this chart in existence prior to the President's speech or afterward?

Dr. Batzel. Prior.

Senator Warner. You were prepared to come in and present this accelerated program. Have you laid that out to the Department of Defense? Where is the accelerated program in the bureaucracy?

Dr. Batzel. We have laid it out before the Department of Energy. We have discussed it with the Department of Defense. We have presented it to the House Armed Services Committee in terms of our view of the technology and what is required to bring it around.

Senator Warner. What direction have you received from those who have worked with you on the budgetary decision as to whether or not we should formalize a request for accelerated development?

Dr. Batzel. We have submitted letters to the Department of Energy with dollar figures related to this particular issue. There has been a study within the Department of Energy about the question of available resources. The outcome of that study to date indicates that there are no additional funds for fiscal year 1983 and no additional funds over and above our existing resources for fiscal year 1984 but with the potential of some increase in fiscal year 1985.

Senator Warner. Mr. Wade, with reference to that response, what is being done about consideration of an accelerated program? Do you wish to participate in this question?

Mr. Wade. I would be happy to, sir.

As Dr. Batzel said, we did look very carefully at the whole issue of what level of resources should be diverted to this particular area. There is not an insignificant amount being diverted to it right now. The study concluded that we could not squeeze our existing budget any more. In other words, we could see no way to defer other projects in order to put money into this particular area.

Senator Warner. When was that decision made?

Mr. Wade. Within the past 45 days, sir.

Senator Warner. Before the President's speech?

Mr. Wade. Before the President's speech.

Senator Warner. Now that he has spoken, is there any rethinking?

Mr. Wade. We believe that the path which we are pursuing, which is additional money in the fiscal year 1985 budget for these programs, "delta" money over and above what is currently being expended, is consistent with the President's initiative.

Senator Warner. What are the dates on which that accelerated pace is predicated?

Mr. Wade. That accelerated pace would require additional money in fiscal year 1984.

Senator Warner. Now, that is the point.

Mr. Wade. That will require additional money in fiscal year 1984. At the current time, Mr. Chairman, we do not intend to seek additional money in fiscal year 1984. We intend to proceed along the path we have defined which carries this program along with all the other things that we have to accomplish. But we do intend to ask for additional money for this particular category in fiscal year 1985.

Senator Warner. In 1985?

Mr. Wade. Yes.

Senator Warner. So, those white diamonds (referring to chart) will have to be adjusted?

Dr. Batzel. Yes, sir.

Senator Warner. I have scheduled another hearing on this subject at which time we may invite you to come back, Mr. Wade, because we have to get to the bottom of this question. We have a responsibility in the Congress to be prepared to advise our colleagues with respect to the feasibility of an accelerated program in these areas.

Now, my colleague has some questions.

Senator Bingaman. Let me follow up a bit on that. I am trying to get at the question of the coupling the President's speech between and what we are actually doing in the way of policy and actions in the Department of Energy which, I gather, is the responsible Department for this purpose.

Maybe each of the witnesses could identify the extent to which the status of their programs and their views on future development in these areas were solicited prior to that statement by the President. Is this something you were called in on or did you find out about it on TV like the rest of us?

Dr. **Batzel**. I found out about in on TV just like a lot of other people did. We have been working in this particular area for a period of years. [Deleted.]

Senator **Bingaman**. Maybe I could ask Dr. Thorn and Dr. Dacey the same question, the extent to which your laboratories were involved in any way and consulted in regard to the President's statement about a new direction.

STATEMENT OF DR. ROBERT N. THORN, LOS ALAMOS NATIONAL LABORATORY

Dr. **Thorn**. The President's statement came as a complete surprise to us. We heard it on TV just like everybody else did. Of course, we have been aware of what has been going on in this area. We have been working on some of these advanced concepts ourselves, but not to the point of any systems analysis or any weapons system.

Senator **Bingaman**. Dr. Dacey.

STATEMENT OF DR. GEORGE C. DACEY, SANDIA NATIONAL LABORATORIES

Dr. **Dacey**. We certainly were not aware that the President was going to make that speech. It came as a surprise in that sense. All three of us participated in discussions with the President's science adviser. At the time this accelerated program was proposed there there was a discussion with both the OMB and the President's science adviser. So through him the President must have been aware of the existence of these programs and the fact that at least some of us felt they needed more funding.

Senator **Bingaman**. I guess the question I have is that we are about halfway through fiscal 1983. Then we have fiscal 1984 and then maybe in fiscal 1985 we will increase funding a little for these programs. It does not seem to me that the actions by the administration and the Department of Energy are consistent with statements that the President was making in that speech about the need to shift our focus.

I understand these are long range programs. [Deleted.] Are we going to do anything in the next 18 months to increase the emphasis in these areas? Or is that something that is not necessary?

Mr. **Wade**. I think we are increasing it, Senator. There is of the order of $30 million more in the 1984 budget in this category than there was in 1983. [Deleted.] I think as a community we have to feel that there are a number of concepts that are under consideration, some of them at very early stages in terms of the physics and the technology, and it just is not clear that a big infusion of money would give you a technological payoff.

I think the way to make the President's initiative in the way he described it is with a very careful, very deliberate, very sound scientific program. Now, we are working to move the diamonds back on the line closer to the enhanced program than at the other end.

But by the same token, admittedly we are not running; we are walking very carefully down this path.

Senator **Bingaman**. Did you question whether we could in fact speed up this X-ray laser development [deleted] under the accelerated funding?

Mr. **Wade**. I think our judgment is that we would have to give up something in fiscal year 1984 to add more money to the X-ray laser program, and I think the collective judgment of the Department and all of the pieces of the Department, including the laboratories, has been that we have about the right balance among the laboratory programs, these concepts of weaponization and so on, and that we ought not to jiggle that in fiscal year 1984.

Senator **Bingaman**. So it is not high priority to speed this up by shifting money from another activity to this?

Mr. **Wade**. It is high priority. We cannot shift money to it without giving something else up. You saw, for example, the fact that our production complex is working at almost the maximum capacity. We cannot meet our commitments to the Department of Defense to finish warheads if we take money out of there to put into this. It is a balancing act, admittedly.

Senator **Bingaman**. Let me ask, Dr. Batzel, have you done an analysis also—I assume you have—of what the available technologies are or are being developed to defeat these kinds of defensive systems?

Dr. **Batzel**. Yes. We have certainly looked to a certain extent at countermeasures; in other words, how you would defeat this kind of defensive system. It looks difficult, but we surely have not looked at it enough to say that there may not be ways around it. It certainly complicates the life of the attacker in many ways. We are not able to say, at this juncture, that we have thought it all the way through and have examined all the possibilities.

Senator **Bingaman**. Have you done an analysis or a study as to whether or not this violates any of our treaties if we were to go ahead on this type of program?

Dr. **Batzel**. [Deleted.]

Senator **Bingaman**. Is the technology for actually tracking targets and aiming this X-ray going forward?

Dr. **Batzel**. The Department of Defense has a major effort in this area related to pointing and tracking which is applicable to their conventional high energy laser program.

[Deleted.]

Senator **Bingaman**. So that technology is applicable?

Dr. **Batzel**. Yes. It is applicable and that technology is proceeding in development.

Dr. **Dacey**. I will mention some of these things in my testimony. Sandia has historically had responsibility for weaponization, system analysis, and hardening. Most of our work is directed toward those issues rather than toward the feasibility of the actual source. We have diverted already something of the order of $10 million from other things to these studies and under the accelerated program we would about double that.

Our concerns are with the question of countermeasures, of acquisition, of what kinds of spoofing the enemy could do to the acquisition system. What are the countermeasures, [deleted]. Those system studies are very important before we make major commitments to weapons systems; to understand what the alternatives and what the possibilities are. At the same time, the R&D that leads to the fundamental capability ought to proceed, because we should not assume that it is not going to work before we see whether it is feasible in the first place.

Senator **Bingaman**. That is all I have.

Should we go on with the other witness' testimony?

Mr. **Smith**. To be sure the record is clear on your best judgment as to when a system like this could be put into operation, recognizing that you do not have responsibility for pointing and tracking, in your best professional judgment, when could a complete strategic defensive system which makes use of the X-ray laser be put into operation?

Dr. **Batzel**. [Deleted.]

Mr. **Smith**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Senator **Warner**. [Deleted.]

Dr. **Batzel**. It surely is.

Senator **Warner**. I am correct on that?

Dr. **Batzel**. You are correct.

Senator **Warner**. How much money? Can you give that figure now?

Dr. **Batzel**. About $40 million.

Dr. **Dacey**. There are other pieces. Our piece is $16 million. I don't know what Los Alamos' piece is.

Dr. **Batzel**. The total is of the order of $100 million.

Senator **Warner**. Divided among the three laboratories?

Dr. **Batzel**. Yes.

Senator **Warner**. Do you agree with that?

Dr. **Thorn**. Yes, sir.

Senator **Warner**. Now, that would require additional funds within DOD for pointing and tracking?

Dr. **Batzel**. I cannot speak to that.

Senator **Warner**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Senator **Warner**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Dr. **Dacey**. [Deleted.]

Senator **Bingaman**. Dr. Dacey, let me follow up on that. I heard Secretary Weinberger on "Meet the Press" or some other program a couple of weeks ago say that he was confident that we could have a completely effective defense system. What is the feasibility of that? It strikes me that what you just described makes the likelihood of something getting through fairly great, even if countermeasures have not been developed. If countermeasures have been developed, it seems the likelihood——

Dr. **Dacey**. One of the fallacies in my view on which Defense has been dismissed, is the notion that it is difficult to produce an absolute defense. It is one thing to have 1 missile out of 1,000 get through and quite another to have 1,000 get through. If you are in fact concerned about the philosophy of strategic deterrence and about reducing the number of weapons on your side, if you can reduce the capability of a mass attack to 1 in 1,000 or 1 in 100, then the utility of the enemies' weapons is substantially reduced and there is a basis for negotiating a reduction. I do not think defensive systems should be considered useless simply because they are not absolute, simply because they do not have 100-percent effectiveness. We have been hoist on that petard for many years and we ought to get off it.

In my view the President's speech is significant, not so much because some particular systems or some particular form of defense is feasible, but rather that we are off, I hope, that long taboo against thinking about defensive systems at all.

Senator WARNER. Gentlemen, we also need your testimony today on the nonnuclear segment of this program. What is the nonnuclear option in your judgment?

Dr. DACEY. There are many options that we are aware of, some of which of course are the responsibility of the Department of Defense, in chemical lasers and things of that sort. We do have a program at Sandia, however, on nonnuclear beam weapons which stem from our pulsed power project. [Deleted.]

You should also hear from the Department of Defense about the nonnuclear concepts that they are working on.

Senator WARNER. The question is addressed to what is under your immediate jurisdiction.

Dr. BATZEL. We have a program at Livermore on charged particle beams and, [deleted.]

Dr. THORN. At Los Alamos we are working on a neutral particle beam, conventional high explosive weapon, pellets, for example, for nonnuclear kill.

Senator WARNER. Are your figures related just to the atomic side?

Dr. BATZEL. Relating only to the nuclear driven.

Senator WARNER. If we should elect to go to a Manhattan-style project in this area of weaponry, would we have to increase the funding for the nonnuclear programs?

Dr. BATZEL. Yes.

Senator WARNER. Assuming the administration and the Congress made a determination to proceed with a strategic defensive effort, we would look at this both from the conventional and nuclear defensive aspect; am I correct?

Dr. THORN. I would like to add, in our case at least, that the nonnuclear is being funded by the Department of Defense at Los Alamos.

Senator WARNER. I am trying to get some idea of the funding requirement.

Dr. DACEY. It depends on what you mean by defense. If you mean defense against all possible forms of attack, these particular initiatives are useful, as Dr. Batzel pointed out, in space. They are not useful against aircraft and so on.

Senator WARNER. I understand that. Again, what we are trying to do is break it down and find out what are the components, what are the programs, what are the funding requirements, the likelihood of the administration coming to the Congress with at least a Manhattan-style project. You have to appreciate that we are doing our best on this side to be responsive to an area which thus far has not been clearly spelled out in the judgment of many. I refer back to the hearing the other day where we sat here for 4 hours with no mention of this situation. [Deleted.]

Dr. **Thorn**. [Deleted.]

Dr. **Batzel**. [Deleted.]

Dr. **Thorn**. [Deleted.]

Senator **Warner**. Let us go back, Dr. Dacey, and you may return to your prepared presentation.

Dr. **Dacey**. I have changed the order slightly, since we are on directed energy weapons, because I think the kind of questions that you have been asking are often overlooked——

Dr. **Batzel**. I am sorry, Senator, as far as my testimony is concerned, I treated the directed energy weapons. I had other issues. In the interest of time I can forgo the discussion and submit a statement for the record.

Senator **Warner**. We will put that in the record.

[The information follows:]

Extended Remarks of Dr. Roger E. Batzel, Director Lawrence Livermore National Laboratory

The subjects of directed energy weapons and the Soviet nuclear weapons program were covered in my oral testimony. As was suggested, these extended remarks cover other aspects of our weapons program, including facility and land requirements; the Inertial Confinement Fusion (ICF) Program and the Special Isotope Separation (SIS) Program.

NUCLEAR WEAPONS PROGRAM

Let me turn to our Weapons Program overall and discuss some of our recent accomplishments as well as our goals and resource needs. At this time the growth in the research, development, and test program is basically one which covers inflation and little more. Nevertheless, with the modest increases in support that we have received over the past several years and with the enthusiasm and the competence of the people working on our programs, we have produced some outstanding accomplishments. Some of those we achieved this past year are as follows:

Completed majority of engineering development of the ground-launched cruise missile warhead (W84).

Completed majority of engineering development of the new high yield strategic bomb (B83).

Initiated engineering development of the MX ABRV warhead (W87).

[Deleted.]

Conducted laboratory x-ray laser experiments.

[Deleted.]

Completed FXR—a powerful flash radiography facility.

[Deleted.]

When I spoke with you last year I presented those research, development, and testing goals that we feel are necessary to provide the health and strength imperative to a nuclear weapons program that is to be second-to-none. Those goals were as follows:

[Deleted] nuclear tests [deleted].

Data per test well above current levels.

Advanced concepts [deleted] supported at higher levels.

[Deleted.]

Continued capability to support a heavy weaponization workload.

Two new major facility construction starts per year.

Obsolete equipment replaced and adequate steady state equipment funding.

U.S. RD&T resources should be increased.

I believe these are goals worthy of being looked at again in light of the trends that have developed during the past year and in view of what we might anticipate in succeeding years. With existing and projected budgets we will find it difficult to increase the number of nuclear tests [deleted] while at the same time providing what we consider to be adequate amounts of diagnostics on each test. Also, as I said earlier, we have not been able to support our advanced concept programs, [deleted] at the levels necessary to proceed at the pace we believe is warranted from a National security consideration.

[Deleted.]

Concerning new facilities, you are well aware that we have emphasized the importance of bringing major new weapon facilities to the Laboratory to make up for many years of neglect in this area. We were gratified recently by the funding which Congress has provided to start construction of the Weapons Materials Research and Development Facility. The total cost is $26.8M. [Our fiscal year 1984 request is $18.2M. The budget now lists $2.9M. The minimum reasonable funding needs to be $7M (finishes the new building), with our recommendation that it be $10M. (Finishes and equips the new building.) The fiscal year 1985 moneys are for existing facility modifications.] We were also pleased to see Congress authorize the High Explosives Applications Facility [HEAF] project, but disappointed that it has not yet been funded. We have identified this facility as one of our highest priority construction needs because of the broad spectrum of necessary high explosives research it will support. It is especially important for our HE safety and vulnerability studies. As you know, Congress authorized this project in fiscal year 1982 but funds have not been appropriated, nor is it in the DOE's fiscal year 1984 budget.

Other facilities which are also high on our priority list are not being provided for in this, and other, recent budget submissions.

[Deleted].

Another item of particular importance is land acquisition. During the past year, the Laboratory was the target of a number of public demonstrations, generally protesting our nuclear-weapons activities. The largest of these involved about 3,500 people and spanned 2 days. Over 1,300 arrests were made. Although none of these involved breaches of our security, one person did enter our security area in a previous demonstration. Unfortunately, it appears that such activities will continue and prudence requires that we assume that their intensity may also increase. Also, you are probably aware that our work requires the presence, both at Livermore and at Site 300, of limited but significant quantities of special nuclear materials. We believe that in today's political climate we must begin to substantially improve our [deleted] facilities for protecting these materials. We have proposed a comprehensive upgrading of our physical security systems to meet what we think are reasonable threat scenarios.

An important part of this security package is the acquisition of additional land around our Livermore site to serve as a security buffer. We need $7M in fiscal year 1984 to buy land to secure East Avenue from Vasco Road to Greenville Road, including the Sandia portion on the South side. It is important to acquire this land as early as possible, since commercial interests are actively planning to develop much of it at present.

I would like to reemphasize the importance we attach to a significant increase in the RD&T budget but at the same time we recognize the pressures and demands created in other segments of the National budget. Clearly there is no easy solution to this dilemma.

INERTIAL CONFINEMENT FUSION

Last year I indicated to you the importance of our ICF Program to the support of our Nuclear Weapons Program. We appreciate Congress's support in providing in fiscal year 1983 the final funding increment necessary to complete the Nova project. The project is on schedule for completion at the end of fiscal year 1984 and is in budget ($176M TEC with the color conversion).

In the beginning of fiscal year 1982 we decided to fill the gap in experiments between Shiva and Nova and to provide early confirmation of the favorable target physics at short laser wavelengths. We have assembled two large Nova-like beams in the laboratory which originally housed Argus. A benefit of this interim facility (which we call Novette), is that we can test and improve the performance of the new Nova large aperture components and the control and diagnostic systems.

The Novette laser has been assembled from both Shiva and Nova components and we also utilized the Shiva target chamber and diagnostics for target irradiation experiments. The system was activated in January and it has already demonstrated its output power goal of 25 TW from 2 beams, or projected to Nova this would yield 125 TW.

The first series of target experiments using the Novette laser is in support of our x-ray laser program.

[Deleted.]

Both Novette and Nova experiments will make significant contributions to our weapons physics understanding and to the promise of laboratory high gain fusion microexplosions.

[Deleted.]

A summary of recent accomplishments follows:

Novette system completed—(on schedule, within budget, performs within specification).

Novette short pulse, preliminary 6.5 TW Green Beams within specifications and 12.5 TW Red Beams exceed specification.

[Deleted.]

Nova building completed and laser assembly begun—(laser on schedule and within budget).

[Deleted.]

We recognize that the extreme pressures on the Federal budget make it imperative to examine every program to be sure that the levels are appropriate. In this area we stress that the Novette [deleted] results are the backbone of this program and adequate support for Nova experiments is also crucial.

SPECIAL ISOTOPE SEPARATION

Special Isotope Separation is an important capability for Defense nuclear materials production, if we are to meet confidently on a timely and cost effective basis our intermediate term weapon-grade plutonium requirements, [deleted]. A single SIS facility could increase the current U.S. production capability [deleted] enabling stockpile modernization and expansion (if required) to be dictated by actual need and not by available supply. In addition to isotopic cleanup of fuel-grade plutonium to weapon-grade, SIS is the only practical means to provide very high purity Pu-239 for reduced radiation exposure. [Deleted.] The Special Isotope Separation Laboratory (SISL) funded by Congress and nearing completion will enable us to [deleted]. There are no technical barriers which limit our ability to proceed with a production plant. We have worked with the Defense Production complex to design a production facility. The joint conclusion reached with the production organizations is that we can achieve full production [deleted] capability in 1988 if a decision to proceed is forthcoming. This position is clearly summarized in the following three unclassified letters from me, Sam Mirshak of the Atomic Energy Division, E. I. du Pont de Nemours & Company, and Paul Lorenzini of Rockwell-Hanford Operations, Rockwell International, which I would like to submit for the record.

FEBRUARY 14, 1983.

Mr. HERMAN E. ROSER,
Assistant Secretary for Defense Programs,
Department of Energy,
Washington, D.C.

DEAR HERM: I am pleased with your statement of intent to proceed to an SIS production capability with our AVLIS process. The peer review process, as a precursor to a production decision, was quite valuable in that no important issues with the AVLIS process were uncovered that had not been previously addressed in some depth. Indeed, Ed Kintner's final report indicated that the technology was sufficiently well developed, that a well managed program can achieve a production capability in the late 1980's.

I am confident that we have developed the technology to the point that a prudent decision can now be made to move forward on an initial production capability. We are fully prepared to support such an effort at a rate consistent with initial production in the 1987-1988 time frame. I was also pleased to see Sam Mirshak's letter indicating that DuPont has reached the same conclusion, and further conclude that the AVLIS process will be substantially lower cost than other processes.

I believe that SIS is important to the weapon program and the nation because it will provide a rapid response capability to respond to a diverse set of potential problems, as well as provide additional material in the short term. We are anxious to proceed. Please let me know if I can be of any help to you in securing the support you need.

Sincerely,

ROGER E. BATZEL, *Director.*

E. I. du Pont de Nemours & Co., Inc.,
Atomic Energy Division,
Aiken, S.C., January 28, 1983.

Mr. R. L. Morgan,
Manager, Savannah River Operations Office,
U.S. Department of Energy,
Aiken, S.C.

SIS Program Assessment

Ref: Letter, R. L. Morgan, July 10, 1980 (SR-TSP-1065)

Dear Mr. Morgan: In the reference letter, you requested that we evaluate the AVLIS process under development at the Lawrence Livermore National Laboratory and the MLIS process under development at the Los Alamos National Laboratory. You also requested that we develop program plans with the other Laboratories and provide needed information to a review panel to assist you in process selection.

We have been actively participating with both Livermore and Los Alamos in reviewing the processes, developing conceptual designs and basic data. We have also performed some essential experiments associated with balance of plant. This work over the last two years has provided sufficient information for both a technology assessment and cost appraisal of the AVLIS and MLIS processes. This information was transmitted to you in the assessment document requested by your staff.

Early in the program, both Laboratories indicated that they believed the technology was available to develop viable production processes. At that time, we indicated that there might be a significant difference in cost, particularly associated with balance of plant.

Studies by our Technical and Manufacturing organizations at Savannah River, which have included participation by our Engineering Department, indicate that the technology as demonstrated by recent experiments for the AVLIS process is understood sufficiently to provide the design basis for the plant.

Our cost appraisal of the two processes shows that the MLIS process would be twice as expensive as the AVLIS process. Analysis also shows that this higher cost for the MLIS process probably will not be reduced substantially even with success of ongoing physics experiments.

We believe that the AVLIS process will provide the best opportunity for meeting the already tight schedule with the available resources and funding for the facility as indicated by your staff.

Sincerely,

S. Mirshak,
Director of Research.

Rockwell International,
Rockwell Hanford Operations,
Richland, Wash., February 23, 1983.

Mr. Alex G. Fremling,
Manager, Department of Energy,
Richland Operations Office,
Richland, Wash.

Deployment of Special Isotope Separation Systems at Hanford (Contract DE-AC06-77RL01030)

Dear Mr. Fremling: As you know, for the past several months, Rockwell Hanford Operations (Rockwell) has been funded to conduct studies on the deployment of Special Isotope Separation (SIS) systems at Hanford. In particular, we have participated in peer reviews to evaluate the two systems being studied, Atomic Vapor Laser Isotope Separation (AVLIS) and Molecular Laser Isotope Separation (MLIS), and briefed the peer review committee on costs and engineering studies in support of deploying both systems at Hanford.

As a result of these efforts, we have been in a position to review in some detail the status of the two systems, the problems and uncertainties associated with their deployment, and their ability to meet program needs. This work has led us to believe that we should advise you of our position regarding the deployment of these systems.

It is apparent to our technical staff that the AVLIS system is clearly the preferred approach with respect to technical status, stage of development, and ability to meet deployment schedules. Therefore, in view of the need to assure that Federal resources are concentrated on the most cost effective alternative, it is our opinion that funding should be aimed at deploying the AVLIS as soon as possible. This would provide the greatest assurance that adequate attention can be focused on the system most likely to succeed and, thereby, that production schedules can be met.

Rockwell has been working closely with Lawrence Livermore National Laboratories to integrate balance-of-plant efforts for the successful deployment of AVLIS at Hanford. On September 8, 1982, Rockwell entered into a Memorandum of Understanding concerning overall management of the program for deployment. We are confident that a strong, technically competent management team is available to integrate efforts at both sites and that Rockwell's balance-of-plant efforts can meet deployment schedules.

Very truly yours,

P. G. LORENZINI,
Assistant General Manager.

DEW PROGRAM DEFINITION STUDY

Objective: Analyze leading candidates, assess technology needs, prepare detailed system engineering and technology base R&D plans.

Approach: Project teams [deleted] technology teams for components evaluation team for alternative concepts.

Output: Design layouts, prioritized recommended system activities, prioritized technology needs, recommended R&D plans, resource requirements.

Duration: December 1982 to July 1983.

Resources: Estimated 24 DMY fiscal year 1983.

DIRECTED ENERGY WEAPONS

Dr. DACEY. This does tell you what we are doing in terms of these other elements of the weapons system. We are trying to look at all the candidates, system engineering technology plans for how we would proceed with the weaponization. After all, once you have gotten a basic energy source, it has to be turned into a practical weapon. That, historically, has been our job. The study at the moment is targeted to be complete in July 1983. This is the very first study.

[Deleted.]

I mention those things merely to point out that moving from an energy source to a practical weapon involves a lot of work, not just on the DOD's part but also on our part.

NUCLEAR FREEZE

What I would really like to do today is to speak to an issue which seems to be terribly important and not well understood, namely the progress which has been made for the past several decades in safety, in vulnerability, and in security of nuclear weapons; that is, improvement and modernization of nuclear weapons. In my view none of these things could have happened, had we had freezes in the past. Sometimes you learn whether you want to engage in R&D freezing, modernization freezing, by looking backward to see what you would have lost if you had done that at any time in previous history. In order to do that, I show here the breakdown of the B-61 bomb. [Chart deleted.] It contains some 4,000 parts. The rest are things that turn it into a weapon, provides for safety, security, command, and control.

I would like to mention just a few of the features of that weapon and show you what has happened over the years, none of which would have happened if we had frozen R&D.

NEUTRON GENERATORS

The first is the neutron generator. Here is the time sequence of the neutron generator. [Chart deleted] the one on the right being the most recent one, about the size of your fist; the one on the left being the one available during earlier years. That makes possible much smaller, more accurate, weaponry and has required continuous development for the past 20 years.

[Chart deleted.]

The next is an example of how our modern technology enables us to fit this small neutron generator into a weapon, the W80. Obviously, the neutrons have to be delivered before the expanding blast blows it up. To know whether or not that is possible, modern computers have enabled us to simulate that, compute the time history of the advancing wave and have demonstrated that we are, in fact, able to protect the neutron generator just long enough for it to put out its neutrons at the time it is required. [Deleted.]

[Deleted.]

RADARS

Another example is the radar. If you look at the radar in that MK-4, it is small, all solid state device. The B43, its predecessor, is shown on the left. [Chart deleted.] Again, none of this progress would have been possible had we stopped doing R&D over the past several decades. That radar on the right is possible because of our capability these days in microelectronics. [Deleted.] We have to do that, by the way, since the industry in general is not interested in that business. It is too small for them.

SAFETY PHILOSOPHY

The next one shows a strong link switch. [Chart deleted.] One of the major changes in nuclear weapons in recent years has been a change in philosophy as to how you provide safety against accidents. The way in which that safety is provided is to have two regions, one region which contains the actual power sources which provide the energy to make the explosion go, a region which is vulnerable to fires and so forth and will burn up, and another region in which this energy is converted to the signals which actuate the weapon and which survives a little bit longer. So if you can manage to hold off the power by some sort of (strong link) action during the accident until the accident destroys the critical components (the weak links), you have an enhanced safety. That is the so-called strong link-weak link philosophy. At the present time the system that sits between the fire and critical components is this mechanical device.

[Deleted.]

PARACHUTES AND GROUND IMPACTS

The next example is the example of parachute delivery weapons. [Chart deleted.] We have computer codes to predict performance of these things and wind tunnels and sled tracks and so on. This 46-foot parachute for the B-83 must retard a 2,400-pound bomb. This was designed by our design group. We have the only capability now in the country that can do parachute design of this type and we are doing it for the NASA space shuttle, for the Army, and for others.

It is interesting to note that when that bomb is delivered, it must undergo crushing but not destroy itself. [Chart deleted.] And to determine that, the next viewgraph shows a computer simulation and an actual measurement of what happens to the cone when it hits the ground. The lower one is an actual picture of what happened to the cone. The top is the computer calculation of what happens to that nose cone when it strikes. You can see that the computer has been very accurately able to predict the shape of the nose during crushing. That code, by the way, is a Livermore Laboratory code, and we have participated with them in that work.

WEAPON CONTROL

The last example here is a permissive action link. [Chart deleted.] This is the device which prevents an unauthorized person from using a weapon because you have to insert the code. The code is not released by the President until after war has begun. There was, in earlier years, a set of combination locks in which you would set dials and so on. The most recent device is shown in the lower corner. It consists of two elements, one is the actual switch, the other is a microprocessor, a silicon chip which does the decoding and permits us to do a much more sophisticated job in terms of multiple codes, changing codes, and so forth, addressing the thing through a cryptographic link.

TESTING

Finally, the last issue I would like to raise here for you to consider is the testing of projectiles for artillery shells. We must do a great deal of testing. [Deleted.]

Senator **Warner**. Excuse me, I have to interrupt you for a minute. I am due to meet the Vice President and majority leader of the Senate on the MX Commission report for which I will have responsibility on the Senate side.

I am going to ask my colleague to continue the hearing. We have two very competent staff members who will continue.

Admiral McKee, would 2 o'clock be agreeable?

Admiral **McKee**. That will be fine, sir.

Senator **Warner**. I would appreciate that.

Gentleman, I express my apologies for the interruptions during the hearing this morning. I will ask that the hearing continue. If I can get back before you depart, I will do so. Thank you.

Senator **Bingaman**. Why don't you go ahead with the rest of your testimony?

MICROELECTRONICS

Dr. DACEY. The only other point I want to make is shown in the next viewgraph. [Chart deleted.] Those tests which require telemetry systems nowadays are performed with modern microelectronics. The next viewgraph shows the interior of such a device. [Chart deleted.] It uses microprocessors, with memory and so on, again with the additional requirement that these devices need to be hardened to radiation. Therefore, we have available to us the capability to perform sophisticated alterations of the standard technology to make it radiation hard. These microprocessors are such that there are about 50,000 or so transistors on a tiny chip. The next generation of microprocessors will require new facilities to get to, say, a million or so, transistors on a chip. That is what commercial industry is moving toward now. This is a picture of such a chip with many of these thousands of transistors on it the size of your little fingernail. [Chart deleted.] The final viewgraph shows the proposed facility for VSLI's which we hope will be begun as part of the fiscal 1985 budget.

Finally, then, I would like to summarize by saying that these examples that I have used are attempting to show that we have had substantial progress over the past two or three decades in many features of weapon components, which lead to enhanced safety, and enhanced control, and enhanced security. And none of these would have been possible if we had, in fact, stopped and frozen our testing, our technology, our looks at the future.

I think that we ought to learn from that before we engage on a similar escapade in the future.

Senator BINGAMAN. Thank you very much.

Dr. Thorn, did you want to testify as to Los Alamos?

STATEMENT OF DR. ROBERT N. THORN, LOS ALAMOS NATIONAL LABORATORY

Dr. THORN. I would like to ask Dr. Robinson if he would help me, both in showing viewgraphs and in answering detailed questions. He is in charge of our national security program at Los Alamos.

I would also like to start out by saying that Los Alamos is celebrating its 40th anniversary this week, and that is the reason that Dr. Kerr is unable to be here. We have invited seven of the nine people that received Nobel Prizes since working at Los Alamos, as well as many of the pioneers who were there during World War II. They are assembled at Los Alamos at the present time, requiring Dr. Kerr's presence.

I am going to skip over much of what I had prepared, but I would like to tell you that one of our recent achievements, which has been an important achievement for Los Alamos this year, is the development of a high yield warhead design for a Trident II reentry vehicle. [Deleted.]

The Trident missiles constitute a most valuable leg of the strategic triad designed to destroy Soviet ICBM's in the hardened silos. [Deleted.] I am happy to say that Los Alamos has been given the assignment to put this warhead into engineering development.

If I could have my first viewgraph, another milestone was reached this year when the W80-1 entered the Nation's nuclear stockpile. [Chart deleted.] You see here an ALCM carried under a B-52 which became operational in December 1982. This is a B-52 flying out of Griffiss Air Force Base in New York. [Deleted.] It is a [deleted] nuclear warhead for use on both ALCM and SLCM and it has enhanced nuclear safety, IHE, permissive action link and nonviolent command disable system.

I would like to turn next to the subject of the advanced concepts. The President's speech, of course, was quite a challenge to the nuclear laboratories. It specifically appealed to us, "* * * to the scientific community who gave us nuclear weapons, to give the United States the means of rendering these nuclear weapons impotent and obsolete". That is quite a challenge and one we welcome.

Los Alamos has many ongoing programs, especially in the advanced concepts area, which we hope will provide the possibility of defense against a ballistic missile attack. We look forward to increasing our commitment to research and development of these technologies and to identifying our technologies that may be useful in moving toward a defense-dominated world and away from a world made secure by the threat of offensive retaliation. [Deleted.]

[Deleted.]

Now, I would like to add that these concepts are defensive in nature and are not weapons of mass destruction. Of course, they could be a part of what the President alluded to in his March 23 address. We must pursue the technology and understand what is feasible, as such concepts may be employed against us. It is inevitable that these new concepts may prove feasible and we must work hard to channel our resources in the most effective way in determining such feasibility.

I would like to turn next to a statement about special isotope separation. [Deleted.]

We think our process offers several advantages, the major one being criticality safety in plant operation.

The next step in development of the Los Alamos process will be construction of a process development module to serve as a pilot plant [deleted].

We have a plutonium qualified facility already and we have the trained support people. No new facilities are required; no new plutonium facilities would be required to establish the process.

I should like to say a word about our ICF program. Our Antares laser is complete. We are beginning to qualify the beam for the first experiments. You see down in the lower right hand corner one beam was fired and that is the picture on the photographic plate that shows how well it is focused on target. We expect that facility to be qualified by October 1 of this year.

Our target fabrication facility, which you see at the top, will be ready for us to accept beneficial occupancy of that building in July. At the present time we are building our targets over in the SIGMA facility and at our old laser facility. One of our targets is shown in the lower left hand corner. That work is proceeding quite well.

I would like to mention a problem area, which is revitalization of facilities. We have a critical need at Los Alamos for revitalization of our facilities. Part of this has already started in revitalization of the test program at the Nevada Test Site. As I pointed out, we are a laboratory celebrating our 40th anniversary. We still have a few buildings left around of that vintage.

Most of our critical nuclear facilities are at least 25 years old. So I am saying that we have to replace these aging facilities. But all new construction requests have been postponed until another year. Through your help we have been able to replace the tritium handling facility and made a start on the detonator facility. However, we need additional funds for the completion of the detonator facility this year.

VERIFICATION AND ARMS CONTROL TECHNOLOGY

National commitment to negotiation of arms control agreements.

Enhanced technology critical to verification capability.

Increasing requirements for instrument production and operation jeopardize R&D base.

I would like to turn next to my last viewgraph, which is on the verification and arms control. I think the foundation of any arms control agreement has to be adequate verification. Yet support for the science and technology base that provides tools for verification is projected to be essentially at constant level of effort.

LTBT demands for our hardware are doubling during the period of fiscal year 1983 to fiscal year 1986. We can meet these increasing commitments only at the expense of the R&D activities on which the future so strongly demands. Competition for our limited resources has seriously slowed full development of the technology which is the very basis of more accurate verification techniques for the LTBT protocol.

Consistent with the Nation's sincere commitment to negotiation of arms control agreement with adequate verification, we can ill afford to neglect the science and technology that will allow new avenues and approaches to be pursued.

I should like to close now by saying I think the 40th aniversary of the laboratory provides a fitting opportunity to review the contributions we have made, the challenges that lie ahead, and conditions necessary to meet those challenges. A long-term stable environment regarding facilities, equipment, and budgetary support will greatly assist in fulfilling the potential contribution to the Nation's interest in the next decade.

Thank you.

Senator BINGAMAN. Thank you very much. We appreciate it.

I understand this is all the testimony that was scheduled for this mornings hearing. Does someone have anything they would like to add on any questions that have come up?

Dr. Batzel, did you have anything that has not been covered?

Dr. BATZEL. [Deleted.]

So that is something that one has to remember. I would just like to reinforce Dr. Thorn's statement that we have to understand what is possible in these technologies because we may have to face them ourselves.

Senator BINGAMAN. I gather from what the chairman of the subcommittee Senator Warner has said, that he is planning additional hearings on the issue of direct energy weapons and what might be needed in that area in addition to what is in the President's budget. I assume there will be an opportunity in the future for each of you to testify again on what can be done in that area if the Congress and the administration see fit to go ahead.

Is there anything else that should be covered?

Mr. Smith. No, sir. At this point in behalf of the chairman, I would like to include a statement submitted for the record by Dr. Alexander J. Glass, president, KMS Fusion, Inc. We will recess until 2 p.m., and will reconvene with Admiral McKee in room 232-A.

[The prepared statement of Dr. Glass follows:]

Prepared Statement by Dr. Alexander J. Glass, President, KMS Fusion, Inc.

INERTIAL FUSION RESEARCH

Summary

The Administration budget request for 1984 calls for a significant reduction in the operating funds appropriated for the Inertial Confinement Fusion program in the Department of Energy. We urge the Subcommittee, first of all, to sustain the operating budget level of the Inertial Fusion Program. We feel that further reductions in the budget will be counterproductive. Furthermore, we request an increase in operating funds for KMS Fusion to allow us to expand and accelerate our activities in support of the main-line objectives of the national program, especially the demonstration of near-ignition target performance. The modest increase requested in the operating budget of the ICF program will not result in an overall budget increase, due to the scheduled completion of major construction projects. We feel that an increased investment in the Inertial Fusion program at this time will yield high dividends immediately, in increased productivity, and will provide the basis for more cost-effective and timely use of the major facilities scheduled to begin operation in the next few years.

Testimony

Fusion is the process which fuels the sun and the stars, and gives the hydrogen bomb its awesome power. For forty years, scientists have strived to harness this source of energy, and reduce it to a controlled, terrestrial scale. To do so would insure a perpetual supply of safe, clean, abundant, and affordable energy.

At the present time, we are on the threshold of the demonstration of the scientific feasibility of controlled fusion, by several technical means, in laboratories in the U.S., Europe, the U.S.S.R., and Japan. There are two primary approaches to fusion, magnetic fusion and inertial or laser fusion. In each approach, the fuel, consisting of deuterium and tritium (the heavy isotopes of hydrogen) is contained and heated to a temperature greater than the temperature inside the sun. At this temperature, the hydrogen nuclei collide and stick together, fusing to form the helium nuclei, and releasing energetic neutrons. These neutrons are captured, and their energy converted to heat to drive a power plant. In magnetic fusion, the fuel, in the form of a low pressure gas, is insulated from the surrounding container by powerful magnetic fields. In inertial fusion, the fuel is held in a tiny capsule, less than a millimeter in diameter, and is heated and compressed by bombarding its surface with the energy of a powerful laser or particle beam. At sufficiently high density, the energy released in the center of the fuel mass is redeposited in the surrounding cold material, and a propagating thermonuclear burn wave is created, which leads to the rapid and efficient release of energy from the fusion reaction. The threshold for this process is the point at which the center of the fuel mass is heated and compressed sufficiently to yield a net release of energy in excess of that invested in the fuel to heat it. This point is called ignition.

The energy potential of fusion is very great. The basic fuel for fusion, heavy hydrogen, occurs naturally in water. If used as fusion fuel, one millimeter of water from the surface of Lake Michigan would supply the electrical energy used by the entire United States for one hundred years. While the ultimate application of fusion energy is the generation of electricity, the neutrons produced by fusion can also be used to transmute the world's abundant thorium resources into fissionable uranium, to create synthetic fossile fuels by neutron radiolysis, or to supply process heat.

The full energy potential of fusion will not be realized until the next century. However, in addition to its energy potential, the inertial confinement fusion (ICF) program also provides near-term benefits to the nuclear weapons program. From its inception, the inertial fusion program has been supported both for its military applications, in the near term, and for its long-term energy applications. The military applications of ICF derive from the similarity between the compression of the fuel container by the energy of a laser or particle beam, and the compression of the thermonuclear secondary, in a hydrogen bomb, by x-rays from the fission primary. ICF provides a laboratory-scale phenomenon which exhibits much of the same physics as thermonuclear weapons. Additionally, the radiation, x-rays and neutrons, produced by an ICF target, can be used to simulate the effects of nuclear weapons on defense systems, supplementing the data currently obtained only through underground testing, but on a smaller scale, and at a lower cost.

The Congress of the United States has supported the development of inertial confinement fusion, for the twofold purpose of military and energy applications, since early in the 1970's. At present, ICF research in the U.S. is concentrated in six laboratories. These include three DOE laboratories, the Lawrence Livermore National Laboratory (LLNL), the Los Alamos National (LANL) and the Sandia National Laboratory in Albuquerque (SNLA), along with the Laboratory for Laser Energetics (LLE) at the University of Rochester, and the U.S. Naval Research Laboratory (NRL), and KMS Fusion. Of these, KMS Fusion is the only private participant. In 1983, funding for the ICF program totaled $190 Million, including $140 Million for operations, $11 Million for capital equipment, and $39 Million for major construction projects.

The major construction projects consist of large facilities at each of the three DOE laboratories. The objective of these facilities is to define the requirements for target ignition in the 1986–88 period. This is seen as the critical time period for decision in the ICF program. Each of the large facilities embodies a different driver technology. At LLNL, Nova, a large glass laser, will become operational in 1985. At LANL, a large carbon dioxide laser, Antares, will commence operation in 1984. PBFA-II, a light-ion beam accelerator, at SNLA, will be complete in 1986. Both Nova and PBFA II are expected to drive targets to near-ignition conditions. Results from these facilities, along with data garnered from other sources within the ICF program, will enable a choice of driver technology to be made late in this decade, for the next phase of the program.

KMS Fusion has played a major role in the development of inertial fusion. The company began fusion research in 1971. In 1974, the world's first successful demonstration of laser-produced thermonuclear reactions took place at KMS Fusion's laboratory, in Ann Arbor, Michigan. Since then, the company has contributed many other "firsts" to the program. KMS Fusion was the first to carry out experiments with short wavelength light, a technique which has been subsequently adopted world-wide. The company is the only laboratory, to date, to carry out experiments with frozen (cryogenic) fuel, a technique generally acknowledged to lead to improved target performance. In 1981, KMS Fusion demonstrated that cryogenic targets perform better than gas-filled targets. Most recently, in 1983, the company developed a unique optical probe for visualizing the evolution of material above the surface of a target. a multi-frame holographic interferometer, capable of providing stop-motion images in a fifty-billionth of a second, with several images being recorded during each experiment, which lasts less than a billionth of a second.

The company is one of the major suppliers of targets and target components within the ICF program. The target fabrication effort comprises roughly half of the company's activities. This effort supports the internal research program at KMS Fusion, and also produces target materials and components for all the other participants in the program. Several European laboratories also buy the sub-millimeter-sized glass Microshell® fuel containers that KMS fusion has developed from fusion use. In addition to target fabrication, the company is pursuing long-term research to develop the large targets needed for the critical experiments to be performed on Nova. These targets involve several techniques and technologies developed at KMS Fusion, including cryogenic fuel, polymer shells, and thickwalled glass fuel containers.

In addition to the company's efforts in materials science and target fabrication, KMS Fusion operates a highly productive experimental facility, the Chroma laser. Chroma is a two-beam laser, capable of producing up to 800 Joules of infrared light in a pulse of 1 billionth of a second duration. This energy can be efficiently converted to visible light, which couples more effectively to the fusion target. The laser is equipped with a pulse stacker, which allows us to synthesize pulses of arbitrary temporal shape, an important parameter for optimal target compression.

The Chroma laser is outfitted with two experimental areas. This allows us to carry out one set of experiments, while setting up another experimental configuration. At present, one experimental area is devoted to a unique optical system, devised and patented by KMS Fusion, which enables us to illuminate a target uniformly from all directions, with the light from the two beams of Chroma. Either gas-filled or cryogenic targets can be imploded in this target chamber, with either infrared or visible light. The second experimental area is used to explore the physics of so-called "hohlraum" targets. The primary approach to driving inertial fusion targets consists of converting the incident energy, from a laser or particle beam, into x-rays, and driving the fusion target with the x-rays. The x-rays are contained in a cavity called a "hohlraum". Details of this approach are classified, because of the similarity to the technology of fusion weapons. KMS Fusion is the only laboratory in the U.S. today equipped to explore both directly driven and x-ray driven laser fusion targets.

During the past year, KMS Fusion carried out over 600 target shots. Since 1980, the company has placed heavy emphasis on improving and developing its capability to detect and measure the complicated phenomena which occur within a fusion target. In any given experiment, it is necessary to measure effects on a spatial scale of hundredths of a millimeter, and a time scale of hundred-billionths of a second. The quantities measured include the density of the rapidly moving material vaporized by the incident laser energy, electrons, neutrons and ions, and x-rays of a wide range of energies. Today KMS Fusion has acquired the capability to measure all these quantities, simultaneously, with high accuracy. In developing our diagnostic capabilities, we have worked closely with the other laboratories in the program, especially LLNL, and gratefully acknowledge their cooperation and support.

By virtue of this increased diagnostic capability, and the flexibility and high data rate of the Chroma laser facility, KMS Fusion has become the principal source of information concerning the basic physics of hohlraum targets in the ICF program. These experiments directly support the large-scale implosion experiments scheduled to be performed on the Novette and Nova lasers at LLNL. A high degree of technical cooperation exists between the scientific staffs of the two laboratories, and the experimental results obtained at KMS Fusion are readily and quickly shared with the LLNL scientists, as well as throughout the program. Both in target fabrication and in our experimental program, we are attempting to make the most cost-effective use of our facilities to support the near-term objective of the national program, the achievement of near-ignition conditions on the Nova laser, late in this decade.

1984 is a critical year in the ICF program. If we are to make effective and timely use of the $176 Million Nova facility, when it begins to operate late in 1985, we must be ready with suitable target designs which can be tested at that time. To get to that point, we must lay the basis of physical understanding of the complex phenomena which occur within hohlraum targets, and develop the appropriate technology to enable us to fabricate these targets. In its role as a support laboratory within the ICF program, KMS Fusion has placed primary emphasis on the achievement of these goals.

The level of operating funds for the ICF program was reduced to a level of $122 million in 1982, from a 1981 level of $140 million. The program impact was severe. For example, KMS Fusion suffered a staff reduction in excess of ten percent, resulting in the loss of several critical skills. In 1983, operating funds in the program were restored to the 1981 dollar level, but without provision for two years' inflation. The administration is proposing to reduce the operating budget for ICF to $127 million in 1984, an effective reduction of 14 percent, even though the completion of the Nova construction project will greatly reduce the overall budget of the program.

We at KMS Fusion fully understand and support the desire at all levels of government to reduce expenditures. We further appreciate that administration spokesmen are unable to call for budget growth, or, as in the case of the ICF program, to oppose drastic reduction, even when they perceive the need for expanded activity. We feel that it is in the best interests of the ICF program and the nation, to urge the Congress not to reduce the operating funds within the ICF program, but even to increase them. We reiterate that this can be accomplished in the framework of an overall budget decrease in the program, due to the completion of major construction projects. We are advocating this course of action, because we feel that a small additional investment now will produce high leverage in forthcoming years. With a cumulative investment in the program of over $1 billion, and the effective use of a $176 million facility at stake, further reductions in the operating budget in 1984 clearly represent a false economy.

In 1983, KMS Fusion received $10.5 million in operating funds approximately 7.5 percent of the program total. We are requesting an increase in funding for 1984, to the level of $14.5 million. We feel that this expansion of our program will enable us to make far more effective use of our facilities and staff in support of the objectives of the national program, and will contribute substantively to making more cost-effective use of the large facilities in the DOE laboratories, as they come on line later in the decade.

With added funding, we will increase our efforts in the development of critical target fabrication technologies. Particular emphasis will be placed on the development of polymeric materials for large fuel containers. These materials need to be strong, capable of holding fuel, and physically uniform. We need to accelerate the development of diagnostic gas fills for targets, which provide characteristic signals from within the target to measure the conditions of temperature and pressure achieved in the implosion. Given our long experience in cryogenics, we feel it is urgent to accelerate the development of large cryogenic targets, along with techniques for characterizing the condition of the frozen fuel within the target.

We cannot carry out the necessary expansion of these activities by reducing other efforts in target fabrication. We must continue to support the ongoing experimental programs in our own and other laboratories, because these are the sources of the vital physics data needed to design high-performance targets. With added funding, we shall accelerate our own experimental program, with first priority given to maintaining a full schedule of experiments on hohlraum targets. Here we need to expand our capability to analyze the experimental data we are generating. Both added staff and equipment are needed. Furthermore, we need to accelerate the investigation of directly-driven targets. KMS Fusion has a unique capability to carry out these experiments. Direct-drive targets may provide the best way to obtain data on ignition requirements and high density implosions, at limited laser energy. These experiments benefit from the ease of diagnostic access, and allow the early development and test of cryogenic targets, as our recent experiments have shown. Direct-drive experiments also provide an excellent test bed for physical measurements, since the geometry of these experiments is essentially one-dimensional. During 1982, for example, we carried out measurements on the flow of energy into fusion targets, using directly driven targets, with informative, and in some cases, surprising results. Further investigation of these transport phenomena is required for a full understanding of target performance.

On a parallel basis, we must accelerate the development of several required technologies. For direct-drive studies, the development of broad-bandwidth drivers, pioneered by KMS Fusion, has been identified by DOE as a high-priority need. We must continue the development of diagnostic instrumentation, since our understanding of critical physics issues is entirely limited by our ability to observe and measure what occurs inside the imploding target. Finally, we must accelerate the identification of cost-effective driver technology, if the ICF program is to be ready for the programmatic decision point scheduled for the 1987–88 time frame.

In summary, we feel that any reduction of operating funds in the ICF program is a false economy, and is unnecessary, due to the schedule completion of major construction projects. We are requesting a modest increase in the ICF operating budget, to enable us to expand and accelerate our activities in support of the major objectives of the national program. We feel that such an investment will yield high dividends immediately in increased productivity, and will provide the basis for more cost effective and timely use of the major facilities scheduled to begin operation in the next few years.

Mr. SMITH. I would like to remind all the participants that there is a great deal of classified information in the room. I will call on the Department to recover the documents that the committee will not have use for. Thank you for your time today.

[Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 2 p.m.]

AFTERNOON SESSION

The subcommittee met in executive session pursuant to recess, at 2:23 p.m., in room SR-232A, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Senator WARNER. First I would like to say that, as you know, I have had a long association with your particular area of work beginning in 1969. Of course, your predecessor is one for whom many of us have unqualified respect and admiration. Indeed there was doubt as to whether anyone could carry on in Admiral Rickover's place. You have not only done that, but you have done it in a very professional and commendable manner. I think the whole country owes you a debt of gratitude and your staff which has helped you achieve these goals.

There is no single program that is more vital to the security of our Nation than the one that you administer. I think I speak on behalf of the members of this committee as well as the staff. We thank you, Admiral. We will insert your prepared statement in the record. You may proceed.

STATEMENT OF ADM. KINNAIRD R. McKEE, DEPUTY ASSISTANT SECRETARY FOR NAVAL REACTORS AND DIRECTOR, NAVAL NUCLEAR PROPULSION PROGRAM

Admiral **McKee**. As you said, you have my statement, so I will not go through that again. I will say a few opening words and then ask what you would like to hear.

At this time last year I had only been in my job 3 months. It has been a busy year. it has been a good year. We have operated well. Six new ships were commissioned, 3,200 young men finished training, and everything is running well.

We have continued to exercise strict control of occupational radiation exposure and disposal of radioactive waste. You are familiar with the record of this program in that regard.

We have also made progress in our preparation for disposal of old submarines. This is the business of whether to put them on the bottom of the ocean or put them in a land burial site. I am sure you are aware that is a lively topic today, and I am prepared to talk more about that if you desire.

Last month we completed three consecutive sea trials of new submarines. That shows how fast these ships have begun to come off the line. The three ships were the *Florida,* our third Trident submarine, and two attack submarines, the *Albuquerque* and the *Norfolk*. Last year the fourth nuclear-powered aircraft carrier, the U.S.S. *Carl Vinson,* joined the fleet.

IMPORTANCE OF NUCLEAR-POWERED SHIPS

You cited your view of the importance of this program. It is manifest when you consider the fact that 40 percent of our major combatants depend on nuclear power. If we make a mistake in our program it will affect our entire military balance.

Senator **Warner**. Forty percent? I'm quoting from your statement, "Today these nuclear-powered warships represent over 40 percent of the Navy's first-line combatants."

Admiral **McKee**. Yes, sir. That is true.

Senator **Warner**. Then you would have to define what is a first-line combatant. I want to get this fact clear in my mind.

Admiral **McKee**. It is a ship that has something to shoot, such as cruisers, submarines, and destroyers.

Senator **Warner**. They compose how much of the 600?

Admiral **McKee**. We have a total of 125 nuclear-powered submarines and 13 nuclear-powered surface ships, a total of 138. So that would mean the number of conventionally powered ships I am talking about is somewhere on the order of 190. It is not a 600-ship navy. Of course, that is the Navy we have today.

Senator **Warner**. That was my next question. As we move into the 600 ship navy under the current plans made known by the Secretary of the Navy, what is your responsibility?

SHIP CONSTRUCTION

Admiral **McKee**. As you know, we have the *Theodore Roosevelt*, CVN-71, well under construction and the two follow-on ships, CVN-72 and CVN-73, that were authorized last year are well along. Funds are obligated. I have the responsibility for those ships. That will bring the total number of nuclear-powered carriers to seven. We will still have only nine nuclear-powered cruisers.

You will recall the *Virginia* and *South Carolina*. Those ships are among the last of that group.

Senator **Warner**. There is no more in the planning?

Admiral **McKee**. No, sir. No more in the 5-year defense plan. It came to the point where they cost about $2 billion per ship on a production basis, armed with current weapon systems. It was determined they cost too much individually. We would not be able to buy enough to go around?

Senator **Warner**. Therefore, what does the Aegis cost?

Admiral **McKee**. A conventional Aegis cost about $1 billion.

Senator **Warner**. It is twice the cost of a sister ship, although it is not exactly a sister ship. There is no comparable ship in fact?

Admiral **McKee**. No, sir.

Senator **Warner**. And none planned?

Admiral **McKee**. No, sir.

[Deleted.]

We have not given up, but currently I am not in a position to give the Secretary of the Navy an alternative that is financially competitive with the conventional cruiser, particularly when we build a lot of them as we are doing right now. [Deleted.] We will have seven nuclear-powered aircraft carriers. We will not have enough nuclear-powered escorts to run with them. We sacrifice mobility in the carriers when we have to slow the whole formation down to the speed required to refuel escorts every fourth day.

So there is merit in reopening that case, but we don't know yet where we will be able to go. I hope by the time I come before you next year to have a more definitive answer to that.

Senator **Warner**. Other than the carriers and Trident, you have no projected involvement in a class of ships?

NEED FOR NEW ATTACK SUBMARINE

Admiral **McKee**. That is correct. Of course, we continue to build the SSN 688 class submarine. The 22d and 23d ships of that class went to sea this year.

Senator **Warner**. Has it been announced?

Admiral **McKee**. No, sir. It has not been announced. We have now decided that the 5-year defense plan will give us on the order of [deleted]. The 688 is a fine submarine, but you have to remember it was designed a long time ago. When we went into a conceptual design on that submarine, I was a lieutenant commander working for Admiral Rickover.

Senator **Warner**. Let me get that more precisely for the record. How many years ago?

Admiral **McKee**. That was 1964.

Senator **Warner**. That is roughly 20 years.

Admiral **McKee**. Yes, sir.

Senator **Warner**. There has been no R&D expended on new design for a nuclear powerplant in the Navy during that period?

Admiral **McKee**. There has been R&D expended. But the only new powerplants we have built since that time have been the ones for the Trident submarine.

Senator **Warner**. I distinguish between build and study. Have there been other studies for surface ships or smaller submarines?

Admiral **McKee**. Yes, sir. There are submarines that never were built.

Senator **Warner**. If I were to let you proceed without interruption we could cover some of these points that concern me.

Admiral **McKee**. Yes, sir. I will cover those points.

Senator **Warner**. Let us do that, then.

SUBMARINE DESIGN

Admiral **McKee**. I brought along some prepared material. The point I would like to make is that it is clear the Secretary of the Navy and the CNO both agree that we need to get on with a new design attack submarine. [Deleted.]

I am going to talk about what we have to do to put ourselves in a position to make the right decision on the submarine, or what it should do and how it should be armed.

As you know, there is a school of thought around here that the way the Navy builds submarines is that naval reactors builds a powerplant and then we design a submarine to go with it. That is not true. The requirements for a new submarine, or any new warship, are determined by deciding what it has to do. I am going to take you through that process and give you some idea of where we stand and the considerations we will have to factor into this work.

Weapons and launchers, are not my responsibility, but all warship characteristics intertwined. Of course, hull design is critically important because submarines are really blimps. The more weight you put in it, the bigger it has to be to hold it up. What I will do this afternoon is talk briefly about this, not so much from the standpoint of what we ought to nave, but the considerations that drive our decisions, and then talk a little bit about what I think we ought to be doing in terms of a propulsion plant.

I said the way to design a submarine is to start with what you want the submarine to do. I will go all the way back. Naval forces in general need to have these characteristics. I think they are pretty straightforward. Any warship needs those characteristics. We would like to have political insensitivity if at all possible, and that of course is a submarine's long suit, because it is able to operate alone, unsupported, at great distances, and it can either show a presence or not show a presence. A good example is the British use of submarines in the South Atlantic conflict. They sent some submarines down there, sank an Argentine ship, and kept the Argentine Navy tied up for the rest of the war. The Argentines did not know whether the British had stayed on station or not. So that factor is an important element in the general characteristics.

Those characteristics are required to support these missions. You are familiar with the six principal missions of the Navy. I have circled the four that our present submarines can perform.

People still tend to think of submarines in the light of the U-boats, and our own World War II experience as commerce raiders. But they are full-fledged warships now and they are able to perform quite effectively four of the Navy's six missions. We need to build them so that they can continue to handle those missions.

If they are going to handle those missions, this is what we have to do. We have to build the submarine that can do these things. [Indicating.] There is no point in spending a dime on a submarine that cannot do the things I have shown in this slide. The idea of a coastal submarine, for example, you have heard about. A coastal submarine cannot do anything as well as surface ships and airplanes can. What a nuclear submarine can do is operate alone and unsupported in waters completely controlled by the enemy, survive in the face of extensive opposition, and extract a favorable exchange ratio so that we can win in the long run.

The mission is not simply to go up and sink a few ships. By virtue of being able to carry out a mission unsupported, submarines can change the entire naval strategic balance with a handful of ships. You will recall during World War I there was a young U-boat lieutenant, Weddigen, who sank three British cruisers and forced the British Navy to redeploy the whole fleet with just one submarine. That kind of ability is still available.

It applies today as well, in the strategic balance. The Soviets have a great concern about [deleted] and they are almost paranoid about our submarines. So their war plans have to take into account the risks that we could pose to their submarines. If they are going to take that into account, it has serious strategic implications for fleet deployment, how much they can afford to commit, and to what missions. If we can get them to tie a bunch of their ships in a defensive strategic posture, that effectively reduces the size of their naval force. So the leverage is very high if we build submarines that can operate alone and unsupported, but to do it requires that we build high performance submarines.

What are the characteristics of the submarine itself that will give us the ability to operate that way? These are straightforward. I will talk about one in detail.

COMPARISION TO SOVIET SUBMARINES

The Soviets have exactly the same considerations, of course. [Deleted.]

We will talk a little bit about some of these factors. One way to measure where our submarines stand is to look at how we are doing in speed compared with the Soviets. [Deleted.] Our submarines do very well. Nevertheless, the Soviets have the ALFA class, which is a high speed submarine. And they have the one of a kind PAPA, which is also a high speed submarine.

Senator **Warner**. How many *Victor* class do they have?

Admiral McKee. They are up to [deleted] in the *Victor* class, of which [deleted] are the lastest version, *Victor III*.

Senator Warner. For the primary mission?

Admiral McKee. Antisubmarine warfare is the primary mission of the *Victor* class.

Senator Warner. That includes what capacity?

Admiral McKee. [Deleted.]

Senator Warner. It is sort of an antiship capacity?

Admiral McKee. Yes, sir. It also has that capability.

Senator Warner. [Deleted.]

Admiral McKee. [Deleted.] That is correct.

Senator Warner. Presumably we have a counterforce capability there?

Admiral McKee. Yes, sir.

Senator Warner. [Deleted.]

Admiral McKee. There [deleted] of them. There are [deleted] of the ALFA's [deleted]. ALFA's are [deleted].

Senator Warner. What is the production rate on the ALFA?

Admiral McKee. The first one went to see in [deleted]. They are up to [deleted] now. The production rate is about [deleted].

I will talk more about that submarine, too, because you cannot divorce speed from quietness. It does no good to be able to run around the ocean at high speed if you can be heard at great distances. [Deleted.]

We build a better submarine. As a warship, the 688 is a far better submarine than ALFA. [Deleted.]

Diving depth looks like this. We built [deleted].

Senator Warner. Where is the Trident on that chart?

Admiral McKee. The Trident is here.

Senator Warner. You said 688. [Deleted.]

Admiral McKee. Yes, sir. [Deleted.] They have spent a lot of money on ALFA. [Deleted.] Even by their terms, it is an expensive machine.

One of the areas in which we have been able to maintain an advantage is that we have gotten to the point where we are [deleted]. We do not expect to refuel the *Nimitz* before [deleted].

NOISE QUIETING

I will briefly discuss radiated noise; this will put in perspective some of our earlier discussion. [Deleted.]

On this graph, [graph deleted] is time and this is radiated noise level in decibels. The units are unimportant. You should understand the higher the number the noisier it is. [Deleted.]

You can see that with successive classes of submarines, the Soviets have gotten quieter. [Deleted.]

At the same time we have come down the same track. We have become quieter all along. We have been able to make substantive improvements, [deleted].

So it is a complicated business. The fact of the matter is that we need to be getting along with [deleted].

SAFETY

From the standpoint of safety, you know our requirements. I won't spend much time with them. You have been acquainted with this program too long to hear a sermon on the subject, and you know our record. The number of nuclear-powered ships goes up, but occupational radiation exposure goes down. We have to continue to do that. It is very important. We cannot indefinitely continue to force it down, because we are about as low as we can get.

[Deleted.]

SUBMARINE SIZE

Now, to get a submarine that will do all these things requires us to build a good sized submarine. I have commanded a 35-ton submarine and I ride Trident submarines at 17,000 tons. So I have experienced the full gamut of size, and I understand what it means.

Another piece of mythology floating around town is that we build fat submarines that are gold plated, and the Soviets build little mean submarines. That is another myth. If you look at displacement of United States and Soviet submarines over the years, you can see we are very similar in size. The laws of physics and the engineering principles of naval architecture don't change. It all comes out about the same way. The anomaly is the *Oscar* class and I will talk more about that in a moment.

Senator **Warner**. Can you give me a few minutes to handle a matter briefly?

[A brief recess was taken.]

Senator **Warner**. All right, Admiral.

PROPULSION PLANT CHARACTERISTICS

Admiral **McKee**. I have talked about the front end of the ship and its military characteristics. Now let me talk about my specific responsibility, which is the propulsion plant.

Again, there is a piece of mythology which goes with my job to the effect we invent a powerplant and the Navy is forced to build a submarine around it. That really is not true. You start the same way and ask what characteristics you want for any naval propulsion plant. Here they are. Of course, weight, volume, and power, you want the best specific power you can get. Then a limit is imposed by these other requirements. That will apply to any naval plant. The unique requirement we have to take into account that affects the way we do the design has to do with the fact that it is a nuclear reactor.

We have to be able to protect the people in and out of the ship. [Deleted.]

Finally, we want controllable transient behavior. This is a characteristic that is not well understood, but is very essential. [Deleted].

We have spent a lot of time talking about how to get more specific power in our ships. The submarine is a blimp, so the more weight we put in the ship, the bigger it has to be, and the more horsepower it takes to push it, and the more weight it needs to put the horsepower in.

It is to our advantage to keep the weight down. However, simply reducing the weight in the reactor plant alone does not do an awful lot. Here is a 688 submarine and the reactor is only this big. That is all. [Deleted.]

ALTERNATE REACTOR PLANT CONCEPTS

As we have proceeded, we have looked very carefully at alternate reactor cycles; this is not something I have done. Admiral Rickover did it over and over again. A detailed analysis of other ways to do business was just completed. [Deleted.]

Senator WARNER. What is used primarily other than in the ALFA class?

Admiral MCKEE. [Deleted.]

SUBMARINE DEVELOPMENT

Now having said all that, we have spent a lot of time in the past year looking to see what we can do to improve the specific weights, that is, pounds per shaft horsepower. If you look at this chart, [chart deleted] this is horsepower here. [Deleted.]

You have the room, and this is not a critical item. It is a big ship. [Deleted.]

You will recall Admiral Rickover's advanced submarine plant. You earlier asked whether we had done any research and development in the last 10 years. The advanced submarine plant is one that he designed that was never built; [deleted].

What we are looking at now, are hypothetical ships along this curve. We believe we can come up with a ship [deleted] using proven techniques and taking advantage of what we have learned over the years, both in the primary and secondary plants. And I have to emphasize they both have to play in this game.

You have to reduce the weight of the secondary plant as well as the reactor plant.

Senator WARNER. What is the Soviet overlay on that chart?

Admiral MCKEE. We do not have much to go on to estimate power densities of Soviet submarines.

Let me see if I can talk without the overlay on the chart. [Chart deleted.] [Deleted.]

I had my own laboratories do a study to see if this hypothetical business works. [Deleted.]

Now, I said we started the 688 when I was a lieutenant commander, but we have done a lot of R&D since then. These are submarines that were never built. This propulsion plant was mocked up and component design begun. Admiral Rickover's [deleted] plant was never built. The mockup is still in existence.

Senator WARNER. Describe why you decided to build a big boat.

Admiral MCKEE. Sir, it turned out too big. It also turns out we should not have built it. We could do better later on. The right thing to do was to go on with the 688. I will show you why.

The SSNX was the high performance submarine considered when we were doing the small submarine studies, you remember, 4 years ago.

The fleet attack submarine is another design that was put together.

[Deleted.]

NEW DESIGN SUBMARINE

The next one we build we would like to have come in about like that. We think we can get the capability that we are talking about [deleted].

Mr. **JAMES SMITH**. What kind of increased offensive capability do you get in that small——

Admiral **McKEE**. This is just speculation, but we want to put double the number of torpedo tubes in the boat, because we are limited right now by the fact that we have only four. We are also limited by the fact that the tubes are [deleted]. You have seen the ships. You know [deleted]. When you do that you limit the speed at which you can shoot, because of the rush of water by them.

[Deleted.]

All these things give us a boat that will be able to stay on station longer, get there quicker and stay there longer, which means an effective increase in the size of your force level.

Mr. **WILLIS SMITH**. Do you have regular tubes on the new?

Admiral **McKEE**. [Deleted] have an interest in them. [Deleted.]

Mr. **WILLIS SMITH**. [Deleted.]

Admiral **McKEE**. [Deleted.]

EXECUTIVE ORDER

Mr. **JAMES SMITH**. Admiral McKee, do you still consider it useful to have the Congress codify the Executive order that established your office?

Admiral **McKEE**. I believe so. I was asked that question by Mr. Stratton in earlier testimony. The Executive order has been extraordinarily useful. I am not sure I could have functioned without it at this point, but I think it needs the longevity it would get by being codified.

Senator **WARNER**. By the way, I believe we should be calling the submarines ships.

Admiral **McKEE**. Yes, sir. We should call them ships. They are major warships.

SUBMARINE DECOMMISSIONING

Senator **WARNER**. Tell me first about the program for decommissioning the Polaris boats. Where are you?

Admiral **McKEE**. I would have to give you the number for the record. I think there are three of them in various stages of decommissioning or going out, two 598's and a 608 class. As you know, as soon as a Trident submarine comes on the line, we have to compensate by deactivating an older ship. We have disarmed a number of them, even though we have not taken them out of commission. There are about 10 of them that are disarmed now, disarmed or out of commission.

[Additional information follows:]

Five nuclear-powered submarines have been decommissioned to date. They are:

Ship and date decommissioned:

U.S.S. *Trition* (SSN 586), May, 1969.

U.S.S. *Halibut* (SSN 587), June, 1976.

U.S.S. *Nautilus* (SSN 571), March, 1980.
U.S.S. *Theodroe Roosevelt* (SSBN 600), March, 1981.
U.S.S. *Abraham Lincoln* (SSBN 602), March, 1981.

Three more nuclear submarines are currently being readied for decommissioning. They are:

U.S.S. *Robert E. Lee* (SSBN 601).
U.S.S. *Ethan Allen* (SSBN 608).
U.S.S. *Thomas A. Edison* (SSBN 610).

[Deleted.]

When it is decommissioned, what happens is that the ship is defueled and the reactor plant is terminated, I guess terminated is the best word, because we cannot bring them back on the line again.

Senator WARNER. Do you mean permanently?

Admiral McKEE. To keep the reactor plant in a condition to run again, we have to keep it full of water and circulate it. We have to maintain the chemistry balance. Once we defuel and empty the water out, it begins to corrode and there is no way to recover. When you look at what it would cost in people and operations and maintenance dollars to keep these ships in a wet lay-up mode, the cost would be very high. Also, during the effort to decommission the ship, they cut it in half and remove the missile compartment, and push the two ends of the boat back together again.

This is how we started by taking the 598 ballistic missile submarine; we opened it up, removed the missile compartment, pushed it back together again, and welded it up, but only enough so it will float. It really is not made back into a submarine. It is just made watertight. Then tests are done to insure the watertight integrity of the boat and it is put in storage in one of the shipyards.

What happens after that is the subject of our disposal efforts.

Senator WARNER. It is a useless ship in perpetuity?

Admiral McKEE. Yes, sir.

Senator WARNER. There was some suggestion we might look at the means by which to save money rather than to have an on-site inspection. What would be your reaction from the standpoint of protection of the power?

Admiral McKEE. If we could control an on-site inspection, perhaps what an on-site inspection would do would be to enable people to verify that the ship was indeed disabled without cutting the missile section out.

Senator WARNER. That is correct.

Admiral McKEE. Because from an overhead view even if you filled a missile tube full of concrete, it would still look like a weapon. I think we could probably do that. We could avoid that if an on-site inspection worked and you took someone and showed him it was full of concrete. It would be a somewhat difficult thing to do, and I am not sure how much money you would save. The difficulty, I think, would be in the ability to control access to the parts of the submarine, you don't want seen, like my part.

I think there would be great diplomatic difficulty in getting that far down the track toward allowing access to one of our ships. From my standpoint, if we precluded access to the nuclear propulsion plant, and to sensitive areas in the shipyards where the submarines are kept, that would take care of the problem.

Senator WARNER. If they were to obtain access to that, then you would have a compromise?

Admiral McKEE. It would compromise a great deal.

Senator WARNER. So that part of the ship has to be sealed off?

Admiral McKEE. Yes, sir. What could be done with the other part is not my responsibility. But clearly, it would appear we would just leave it like it is and take them down and get some sort of certification that it is inert. That would save you about $3 million per ship.

Senator WARNER. Cutting the ships up and taking the thing out?

Admiral McKEE. Yes, sir. Money would still go to lay up the reactor plant.

Senator WARNER. You mean permanently?

Admiral McKEE. Yes, sir. To take the fuel out and all that.

Senator WARNER. You have to cut that out. You would have to do that anyway?

Admiral McKEE. Yes, sir.

Senator WARNER. What are the options now to get rid of the ships that are useless?

SUBMARINE DISPOSAL

Admiral McKEE. We have two options. One is to bury them in the ground, and the other is to bury them at sea. As you know, we are going around the country trying to show what the options are.

Senator WARNER. What do you mean, going around the country?

Admiral McKEE. We have filed a draft environmental impact statement, and we have had hearings in four States, California, Washington, North Carolina, and South Carolina. We are trying to figure out the best way to dispose of the reactor compartment. All we have to dispose of is the reactor compartment and its contents.

In the reactor compartment there is, as you know, the primary system. When we are getting ready to dispose of it, the core is taken out. What is left is a lot of steel that has been irradiated over a long period of time. So any release of radiation from this steel would come after the full and reactor vessel had corroded. It is a question of which process goes faster, corrosion or radioactive decay.

If we have a situation where corrosion is slower than radioactive decay, no significant amount of radioactivity would be released to the environment. The reactor compartment is the part of the submarine that has to be disposed of. There are two alternatives for doing it. One is to bury ashore. We would put the submarine in the dock, cut it in half, and remove that section of the reactor compartment. We would put it on a barge, tow it up the river, put it on a transporter, bury it in the ground and cover it over. We would then scrap or sink the rest of the ship the way we would any other used warship.

The other alternative is to bury it at sea. In that case we would not spend the money to cut the ship up. We would simply rig the ship so that it would flood rapidly and evenly, tow it out to an EPA-approved site, and let her float down to the bottom. It stays there while intrinsic radioactivity in the steel inside this compartment decays.

Of course, the radioactivity is still inside the reactor compartment, inside the pressure hull itself. Before it can be of any concern, the whole compartment hull, which is [deleted] thick steel, has to corrode away. We think ocean disposal is a good option, but there is a lot of emotion involved in it.

Senator WARNER. What are the facts? Is it detrimental to the environment down there?

Admiral McKEE. No, sir, it is not. Here are the calculations on radiation exposure during the year of largest impact. In other words, even at the time when we have the most radioactivity still in the vessel, it could cause no difficulty. This is the maximum amount of exposure, a conservative estimate.

Senator WARNER. Translate that into X-rays or whatever we do to sustain our health.

Admiral McKEE. You get 25 millirem from getting a chest X-ray.

Senator WARNER. Is that 6,000?

Admiral McKEE. No, sir. The first number is six-thousandths of a millirem from land burial. The second number is two ten-thousandths of one millirem from sea disposal. So both are insignificant.

You get 2 millirem from making a round trip flight from Los Angeles to New York.

Senator WARNER. From what?

Admiral McKEE. Radiation exposure from cosmic rays, just flying in the airplane.

Senator WARNER. At that altitude?

Admiral McKEE. Yes, sir. If you live in Denver, you get considerable extra exposure because you are that much higher in the air. So this amount of exposure is insignificant in both cases.

Senator WARNER. Yet you have been unsuccessful in being persuasive.

Admiral McKEE. Yes, sir, we have thus far been unpersuasive. We have a number of experiments going to help prove our case. We have samples of reactor steels in the ocean at 13,000 feet. We pull some of them up every year to verify the corrosion calculation.

We are not talking about disposing of any submarine several years if we decide to pursue this option.

Senator WARNER. Why are we waiting that long?

Admiral McKEE. Because we are not ready. Detailed, site-specific technical work to make sure we know the right site to handle this has yet to be done. We started with the environmental impact statement early on, so that we would have adequate time to handle the arguments.

In fact, ocean disposal is just as safe and it is less expensive than land burial. You do not have to cut up the ship and lug it around.

Senator WARNER. The differential being $2 million per ship?

Admiral McKEE. Yes, sir; $2 million per ship.

Mr. JAMES SMITH. You are going to do this with how many ships between now and the year 2000?

Admiral McKEE. It depends on whether the ships have a 25- or 30-year life. A 30-year life is what we project right now. We will have somewhere on the order of 85 to 90 ships to dispose of by the year 2000. It will cost a lot of money. Remember, this is $2 million in today's dollars.

SOVIET SUBMARINE DISPOSAL

Senator WARNER. [Deleted.]

Admiral McKEE. [Deleted.]

Senator WARNER. [Deleted.]

Admiral McKEE. [Deleted.]

PROPOSED NEW EPA QUALITY STANDARDS

Mr. JAMES SMITH. The Environmental Protection Agency has proposed a new set of air quality standards. These standards would restrict emissions from each site to the amount that would cause an annual dose equivalent of 10 millirems to the whole body. Have you looked at those standards to see what they would do to your operations and facilities?

Admiral McKEE. No, sir, we have not. We will have to find out what they mean by an air burden. I do not really have enough information on that to make a statement.

Mr. JAMES SMITH. The testimony this morning from the Department of Energy officials was that this was potentially very difficult to accommodate, and if it could be accommodated, very expensive to accommodate in some of their facilities. I would invite you to look at these and to write something for the record for the committee's purposes.

Admiral McKEE. Yes, sir, we will look at them and provide that for the record.

[The information follows:]

Naval Reactors has reviewed the proposed EPA air quality standards. Nuclear powered ships, associated support facilities, and the Naval Reactors laboratories would meet the proposed standards now.

Enriched uranium is provided to Naval Reactors' fuel supplier by Department of Energy facilities which are not under the cognizance of the Naval Reactors program. The Department of Energy is studying the impact of the proposed regulations on these and other nuclear facilities.

Senator WARNER. I just asked counsel for the committee to examine the budget submission period. He has said it is in good shape. Thank you Admiral for your fine testimony here today.

[The prepared statement of Admiral McKee follows:]

PREPARED STATEMENT OF ADM. K. R. MCKEE, DIRECTOR, NAVAL NUCLEAR PROPULSION PROGRAM

Last year, when I appeared before the Senate Armed Services Committee, I had only completed 3 months as the Director of the Naval Nuclear Propulsion Program. I explained then my commitment to the program's standards of technical integrity and operational excellence that have been the hallmark of this unique national defense program. A lot has happened since then, and today I am able to report to you from a broader perspective of where we are and what should be done.

Last month I participated in the initial sea trials of three new submarines—the *Florida*, our third Trident submarine, and the *Albuquerque* and *Norfolk*, our latest SSN 688 class attack submarines. These ships will join the fleet later this year, bringing the Trident submarine force to three, with seven more authorized—and bringing the 688 class attack submarine force to 23, with 18 more authorized. The Navy's 1984 budget request will add one additional Trident submarine and three attack submarines to that force.

The fourth nuclear powered aircraft carrier, U.S.S. *Carl Vinson*, also joined the fleet last year, and the fifth, *Theodore Roosevelt*, is under construction at Newport News. Work has also begun on two more aircraft carriers authorized by Congress last year.

Today, these nuclear powered warships represent over 40 percent of the Navy's first line combatants—125 submarines and 13 surface ships. These are the most versatile and effective warships of their kind in the world today. They continue to maintain an unprecedented tempo of operations for a nation at peace. Their ability to do that, year in, year out, has been a major factor in our national strategy of forward deployment.

It is particularly important to recognize the contribution of our Trident/Poseidon force to our strategic deterrent posture. A substantial portion of the U.S. strategic nuclear warheads and the most invulnerable are based at sea. The true value of this major investment can only be measured in the fact that they have remained unused.

The ability to meet our commitments rests on several basic principles that are reflected in the design and construction of these ships, and in the selection and training of men who operate and maintain their nuclear propulsion plants. Over the years, Admiral Rickover testified to the importance of these principles before this and other congressional committees, and to the need for your continuing support. There is nothing remarkable about the fundamentals that govern the Naval Nuclear Propulsion Program. What is unique—in our Navy and the world—is our record of adherence to them.

Nothing has changed. Our record of safe and effective operation continues to depend upon the technical integrity of a small group of dedicated headquarters and field personnel in my organization, and upon the operational skill and dedication of the men who operate these ships daily under difficult, demanding, and at times, dangerous conditions.

The Naval Nuclear Propulsion Program makes extraordinary demands on these men—long hours, endless training, qualification, and requalification. It is not enough that they must achieve a singular level of professional competence. They must also prove their competence over and over again; and all this they must do in the face of extended and frequent separations from their families.

To meet our national commitments, our attack submarines average about 50 percent of the time away from port, and our strategic deterrent submarines 65 percent. Our nuclear aircraft carriers (CVN's) operate at a comparable tempo. This is more than twice the comparable Soviet peacetime tempo. Of course, our operating tempo increases substantially in periods of crisis.

It is also useful to view these demands on a broader scale. For example, our submarine officers and enlisted men comprise only about 4 percent of the Navy, yet the ships they operate contribute over one-third of our combatant forces.

Where do we get such men? What makes them stay?

Certainly, there is the challenge of the job, working with competent peers, and the satisfaction of doing important work well. There is also the psychic income that derives from being part of a small, select group of people that enjoys a unique reputation for professional competence. But these factors alone are not enough.

Recognizing this, Congress has supported special pay incentives to help attract and keep the people we need. As a result, our accession and retention trends are improving in some areas. In others, we continue to fall short.

Overall, the trends have become favorable, but the situation is fragile. When trends begin to improve, even a little, there is always the temptation to conclude that no more needs to be done. There lies the irony—the better our talented people do their jobs, the less apparent the need for these talented people and for incentives commensurate with the demands we place on them. These men remain extremely marketable in today's technologically advanced industrial environment.

Our program now operates 168 nuclear reactors and trains over 3,000 new officers and men each year to man a growing fleet. All this represents a major investment in combat capability. You have the right to ask if it has been worth the price. My unequivocal answer is yes.

Today's force of nuclear powered ships is fast, and heavily armed. They have the range and endurance to carry out their mission anywhere in the world. Tough and flexible, they are built to take punishment and stay on the line.

Our submarines also have special characteristics that are essential to the unique requirements of submarine warfare. Silent and deep diving, they can operate alone and unsupported, even in waters controlled by a potential enemy. Properly handled, they can meet any competition on their own terms.

In the final analysis, these are the most effective warships of their kind in the world today. They are also expensive, but well worth what John Adams once referred to as "the toil, blood, and treasure it will cost . . . to defend these States."

That brings us to an item of traditional congressional interest. How are we doing today? Are we ahead or behind?

Today, the honest answer is that, with adequate technical latitude to retain the initiative, we can prevail at sea. You have given us the tools and individual talent to do that. But what we can do today is not the only issue in this hearing. The budget you are considering must do more than provide for maintenance of our present capability. It must also provide assurance of a favorable balance in the years to come. To do that requires a full understanding of the trends on both sides.

We are good at what we do, and well equipped to carry out our mission. But the Soviets are good too, and getting better. They have introduced five new classes of submarines in the last seven years. They seem to be getting ready to build their first CVN, an obvious indication of their growing interest in projecting power away from their shores.

They have not only built a blue water Navy to contest our maritime supremacy anywhere in the world; they have also developed the infrastructure needed to support a major continuing effort to maintain favorable trends in both the quality and the quantity of major warships.

The result is clear evidence of a continuing Soviet commitment to maritime excellence. That commitment can be seen in their ability to graduate at least 10 times as many naval architects and marine engineers per year as we do, and in their development of a submarine building capacity at least twice ours. More important, they use that capacity to build at a faster rate than we do.

It is also clear that they fully recognize both the deterrent value and combat potential of a large and effective submarine force. Recent events of the South Atlantic campaign again confirmed these principles as a handful of British submarines controlled the surface of ocean areas surrounding the Islands. The same conflict also proved again the importance of controlling the airspace over a naval theater of operations. We cannot afford to assume that the same lessons went unnoticed by Soviet naval commanders.

We must depend on continuing quality and adequate numbers to make up for their improving sophistication and numerical superiority. However, favorable margins in the parameters by which we measure our ability to control tactical and strategic engagements are steadily decreasing in the face of recent Soviet improvements. I would still rather command a *Los Angeles* class submarine than any of today's Soviet counterparts, but I am concerned over the current trend of Soviet advances. We cannot afford to stand by while our advantage erodes. It is time to start on a new design SSN.

Secretary Weinberger, in his testimony on the fiscal year 1984 budget submission, emphasized the importance of developing a new design attack submarine that will "capture the latest advances in technology." We have the ability to do this, and I strongly recommend congressional support of this effort.

The fiscal year 1984 budget does not contain that specific new start, but it does provide for the R&D efforts needed to bring us to the point of initial authorization later in this decade. We must get on with it.

Let me return to the subject of people. In the final analysis, the ability to maintain our record of safe and effective operation can only be preserved if we can continue in the standards of selection, training, qualification of people in every facet of our program, civilian and military, and can meet our retention goals across the board. Congressional support has been instrumental in our success thus far, but this subject will continue to require your special attention.

The Naval Reactors portion of the Department of Energy's fiscal year 1984 budget request includes $490 million in operating requirements, $20 million in capital equipment needs, and $103 million to continue construction work. The work is directed at improving reactor performance—increasing power and extending lifetime. It includes diverse efforts such as: testing the Trident plant and an advanced reactor for use in existing ships; developing the Submarine Test Core to determine the utility of new materials; constructing a facility to provide a second source for naval fuel; and developing the Advanced Fleet Reactor. The total request comes to $613 million. I have attached a detailed description.

FISCAL YEAR 1984 DEPARTMENT OF ENERGY BUDGET REQUEST FOR THE NAVAL REACTORS DEVELOPMENT PROGRAM

The naval reactors development program provides for the design, development, testing, and evaluation of improved naval nuclear propulsion plants and reactor cores having long fuel life, high reliability, improved performance, and simplified operating and maintenance requirements. The nuclear propulsion plants and cores cover a wide range of configurations and power ratings to meet warship requirements ranging in size from small submarines to large surface ships.

Major development efforts underway in the naval reactors development program include: an Advanced Fleet Reactor which will take advantage of new fuel element concepts and reactor equipment technology to provide improved performance and increased endurance; a Submarine Test Core, designed to test advanced reactor materials at the pressure, temperature, and power conditions of an operating reactor plant environment; work on the Trident submarine propulsion plant, including test and evaluation of the plants in the land-based prototype and the U.S.S. *Ohio;* and the higher power, longer life D2W core for shipboard application. Ongoing development efforts include: advanced fuel processing and manufacturing techniques; materials development research aimed at improving reactor plant performance and endurance; and continued operation of eight prototype reactor plants for research and development and training purposes.

The fiscal year 1984 naval reactors development budget request is $613.0 million. The details of the request, by category are:

[Budget authority, in millions of dollars]

Plant development, operating expenses	$59.0
Reactor development:	
Operating expenses	188.8
Capital equipment	20.0
Construction	[1] 103.0
Subtotal	311.8
Reactor operation and evaluation, operating expenses	112.0
Enriched material,[2] operating expenses	120.0
Program direction, operating expenses	10.2
Total naval reactors development [1]	613.0

[1] Within the requested construction dollars, funds in the amount of $23 million have been previously authorization. Total authorized funding requested is $590 million.

[2] Funding for enriched material was included in the uranium enrichment budget in fiscal year 1982 and prior years and the materials production budget for fiscal year 1983.

The fiscal year 1984 budget request of $613 million provides for a continuation of current programs. The increase of $86.1 million over fiscal year 1983 is primarily due to escalation, development of the Advanced Fleet Reactor, servicing and refueling of prototype reactor plants, construction of the materials facility, and increased Navy need for enriched uranium.

A discussion by budget category follows:

I. PLANT DEVELOPMENT

The Plant Development effort is aimed primarily at improving plant reliability and performance. This includes developing improved reactor and steam plant components and systems, and developing alternate plant materials, new heat treatment methods and new chemistry treatment and water purification methods.

Component and system development work starts with reactor plant arrangement studies based on operational requirements and continues through design, testing, and operational support of installed equipment. In addition to performance and reliability, noise reduction and shock resistance are particularly important. This work involves developing sophisticated mathematical models with which to predict performance in simulated plant operation and to evaluate actual component performance at a later date. Full scale mock-ups are used to verify installation suitability and maintenance capabilities of components and systems prior to manufacture and testing of components.

The interaction between various materials and water chemistries is important to the performance and reliability of nuclear propulsion plant systems. Alternate material and chemistry candidates are subjected to extensive testing and evaluation. The most promising are then pursued under prototypal conditions and environments to verify material performance characteristics prior to qualifying them for application in reactors. This program includes development of new techniques for testing and analyzing materials, water chemistry performance, heat treatment, corrosion, mechanical properties, and failures.

In fiscal year 1984, Naval Reactors will continue Plant Development efforts including: develop materials leading to improved component performance; conduct plant analysis for backfit of an advanced reactor in the CGN 36 and 38 class cruisers; continue preparation of procedures for future refuelings of SSN 688 class ships;

develop simpler and less costly methods for cleaning steam generators; and develop advanced design reactor equipment for application to naval nuclear propulsion plants.

II. REACTOR DEVELOPMENT

The Reactor Development effort focuses on improving the power capabilities, endurance, and reliability of naval reactors ranging from relatively small submarine reactors to the large ones used in nuclear powered aircraft carriers. The objective is to design and develop improved reactors based on the latest reactor concepts, technology, and experience.

Reactor fuel and poison elements are very important in developing reactor cores of increased endurance and power. These must be able to accommodate the higher fuel and poison loadings, and sustain the irradiation damage that is inherent with higher power densities and longer operating lives of reactor cores. To ensure high integrity over the long lifetimes of present cores requires care and attention in establishing the configurations of advanced fuel and poison elements. These high loaded cores also require development of advanced control rod materials and control concepts. Optimizing the performance, life, and power of reactor cores in the hostile environment in which they operate demands sound and careful engineering and powerful analytic tools to predict the long term reactivity behavior and material response in various core concepts.

The development effort includes the fabrication of prototype cores and components for installation, operation, and testing in prototype reactor plants under operating conditions. This includes developing sophisticated processes and inspection techniques to ensure quality during manufacture of these advanced cores. Data from examination of expended cores constitute important feedback as to the long term behavior of these cores from the standpoint of nuclear characteristics, materials, and performance.

During fiscal year 1984 reactor development work will include: fabrication of advanced fleet reactor equipment; performing physics and design studies for the Advanced Fleet Reactor; developing the nuclear, thermal/hydraulic, and mechanical design of the Advanced Fleet Reactor; completing fuel assembly development for the Submarine Test Core; performing physics analysis of Submarine Test Core fuel modules; and work on the Development Fuel Core.

Additional work in this area will include: examining expended cores to evaluate core performance; assessing new technologies for advanced fuel and poison elements; performing thermal, hydraulic, and mechanical tests of core components; developing design concepts for advanced reactors; and developing processing technologies for naval fuels.

Capital equipment

Capital equipment requirements for fiscal year 1984 include computer-aided drafting equipment for the laboratories as well as other laboratory support equipment. This equipment is necessary for the laboratories' continued development of advanced technology and for the continued safe operation of the prototype reactor plants.

Construction

Construction funds are requested in fiscal year 1984 for the Modifications and Additions to Prototype Facilities [MAPF], project No. 81-T-112, the Materials Facility, project No. 82-N-111, and the Addition to the Radioactive Materials Laboratory, project No. 83-N-102.

The MAPF project provides for modifying and adding to the engineered safety features of several prototype plants. The work primarily involves upgrading the emergency fluid and electrical systems, and includes construction of necessary equipment and support buildings. The prototype plants involved are the DIG and S3G plants at West Milton, N.Y., and the SIC plant located in Windsor, Conn.

Funds for the Materials Facility at Savannah River, South Carolina, are to continue construction of a second source for manufacture of naval nuclear fuel. Initial funds were provided in fiscal year 1982 and work is presently underway. The Department of Energy is currently dependent on only one supplier for the naval nuclear fuel upon which over 40 percent of the Navy's combatant ships depend. This leaves the Naval Nuclear Propulsion Program vulnerable to the risk of prolonged disruption in fuel supplies because of strikes, operational shutdowns, natural catastrophies, or other unanticipated problems. The added capacity provided by this project will also allow flexibility to accomodate an expanded shipbuilding program.

In addition, funds are requested to complete the design and construction of a shielded facility to be located in an extension of the Radioactive Materials Laboratory at the Knolls Atomic Power Laboratory. The new shielded facility will provide needed additional testing and examination capacity for Naval Reactors' efforts in analyzing advanced fuel systems currently under development as well as continued evaluation of existing fuel systems.

III. REACTOR OPERATION AND EVALUATION

Reactor Operation and Evaluation involves the operation of land based prototype nuclear propulsion plants and their related servicing and evaluation. These prototypes are operated to test developmental nuclear propulsion plants, cores, and components. While accelerated testing and special test facilities are valuable aids in simulating behavior of various components and materials, there is no substitute for the actual in-service experience obtained from the operation of the prototype plants. Only through actual operation is it possible to determine performance, confirm designs, and test various plant conditions under operating circumstances and without interfering with fleet operations. The prototype reactors and components are fully instrumental to provide test data needed to support developmental programs. The prototype plants provide an ideal test bed for new concepts, materials, and designs while gaining operational experience in advance of reactors in the fleet.

Work in this area also includes developing reactor servicing procedures and equipment as well as actual reactor servicing. Servicing work includes: maintenance, refuelings, disassembly, fuel exchange and reassembly operations on reactors, examination of installing reactor components, and removal of reactor components for examination. Equipment and procedures development for prototype operations are used to the maximum extent possible in preparing for the servicing and refueling of shipboard reactors.

Work in the Reactor Operation and Evaluation area in fiscal year 1984 will include: performing thermal/hydraulic analyses for operation of prototype reactors; preparing for and following performance of prototype plant refuelings; providing technical assessments of plant operating conditions; modifying facilities; performing overhaul and maintenance effort; preparing for the S5G and S1W prototype plant refueling/overhauls; conducting the D1G interim inspection; completing the S1C refueling/overhaul; and preparing procedures for S3G, MARF, and S8G refueling/overhauls.

IV. ENRICHED MATERIAL

The Enriched Material portion of the Naval Reactors Development budget provides for enriching the uranium used in manufacturing reactor cores required for the nuclear powered ships of the U.S. Navy. The enrichment work is carried out by the DOE Office of Uranium Enrichment. This work is essential to the National defense.

The amount of enriched uranium purchased each year is determined by the needs of the Navy. The planned number of ship refuelings, tempo of fleet operations, number of ships under construction, and other schedular requirements dictate the number of cores to be fabricated for the Navy in a given year. This figure in turn determines the amount of enriched uranium needed by the core manufacturers in that year. The required enrichment services are then obtained from the Office of Uranium Enrichment.

Funding for Enriched Material was included in the Uranium Enrichment program for fiscal year 1982 and prior years, and in the Material Production program in fiscal year 1983.

V. PROGRAM DIRECTION

The program direction funds provide for salaries, benefits, travel, and other expenses for 207 full time Federal employees at the Naval Reactors, Pittsburgh Naval Reactors, and Schenectady Naval Reactors Offices in support of the Naval Reactors Development and Water Cooled Breeder programs.

Naval Reactors operates with austere staffing. Existing personnel are used to the greatest extent practicable in staffing new efforts and expansions of existing programs. Improvements in work force productivity have been achieved over the years, despite increasing workloads, by effective use of available staff.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

NEW PRODUCTION REACTOR

Senator **WARNER**. What is the cheapest way in terms of initial capital outlay to obtain the required extra production capacity once the current N Reactor is retired? How much would this alternative cost?

Mr. **WADE**. If lowest initial capital cost is the criterion of choice to obtain the required extra production capacity, then a Zero Electric Power Heavy Water Reactor at Savannah River, costing approximately $2.1 billion, would have the lowest initial cost.

Senator **WARNER**. How does the fact that Hanford has had previous qualification for nuclear reactors through NRC licensing activities affect your choice of site among possible locations for a new production reactor?

Mr. **WADE**. Since the New Production Reactor will not be licensed by the NRC, that criterion will have no impact on the choice of site.

Senator **WARNER**. How does the fact that the Idaho Falls site does not have sufficient federally-owned water rights affect the decision on it as a possible site for the NPR? How much would it cost at a minimum and at a maximum to acquire sufficient water rights? Would such action require congressional action other than the appropriation of funds?

Mr. **WADE**. Depending upon the concept chosen for the NPR, DOE may already hold sufficient water rights at the INEL site of DOE for the operation of the NPR. If the NPR requires more water than DOE is authorized to pump under its current permit, additional water rights could be purchased or possibly obtained through appropriation. If appropriation of water rights becomes possible, there would be no cost to DOE. The current estimate of the maximum cost to DOE to purchase the required water rights is approximately $290,000. No congressional action would be required other than appropriation of funds.

Senator **WARNER**. What are the unique features of the Idaho Falls site which would justify locating the NPR there?

Mr. **WADE**. There are several unique features which would justify locating the NPR at the Idaho Falls site. First, it is a remote site with the lowest population density within a 50 mile radius of the three sites being considered.

Next, an examination of the environmental issues, reveals nothing to preclude the siting at INEL and, in fact, there are some advantages to the use of INEL. No flowing streams leave the site, therefore there are no problems related to the thermal and radiological pollution of surface water and compliance with the Clean Water Act. Compliance requirements for atmospheric releases and groundwater are similar to the other sites.

If the cost of operating an electricity-generating NPR is a key criteria in choosing a site, Idaho Falls has some advantages over other potential sites. The Idaho Power Company has publicly stated and formally documented its willingness to act as a lead utility in a consortium of six utilities to purchase steam from the NPR to produce electrical power. This willingness includes providing the necesary capital for the turbine-generator facilities and the necessary transmission lines.

Finally, in addition to INEL's location, the site has many features that can provide additional support to the project. The Advanced Test Reactor (ATR), Experimental Breeder Reactor II [EBR-II], Power Burst Facility (PBF), Loss-of-Fluid [LOFT] Facility, and the Transient Reactor Test [TREAT] Facility all are available and can provide the unique fuel and tritium target qualification and safety testing that may be required by some of the NPR concepts. Fuel and waste processing requirements for the NPR concepts could be met through modification to the present and planned Idaho Chemical Processing Plant [ICPP] Facilities or could be processed offsite depending on ICPP workload. The site also has a large technical base of cold and hot laboratory facilities, hot cell examination facilities, manufacturing support facilities, rail and road facilities, as well as a large number of nationally recognized technology base programs.

VERY LARGE SCALE INTEGRATION FACILITY

Senator **WARNER**. Regarding the new facility for Very High Speed Integrated circuits, what was the review process by which Sandia was chosen as the site for this facility? Was there any DOD review that compared the capabilities of Sandia with other Government laboratories as the potential site? Please submit any supporting documents to the committee. If there was not any DOE or DOD review, what are the justifications for picking Sandia as the site compared to other Government laboratories? Is there any justification for this facility which is directly tied to a nuclear weapons design mission?

Dr. DACEY. Sandia National Laboratories has the responsibility within DOE to develop and design the electronic packages contained within nuclear weapons. These packages perform the functions of arming and fuzing, command and control, and nuclear safety and security. The electronics in these systems must survive and frequently function through very hostile environments, including extreme levels of nuclear radiation. Furthermore, very little space or power is normally available to perform the electronic functions because of system limitations. Because of these environmental and system constraints and because of the unavailability of suitable microelectronic components from industry, Sandia found it essential in the early 1970's to begin a program to develop in-house radiation hardened integrated circuit technologies and designs. This effort resulted in a Large Scale Integration [LSI] design and fabrication facility which has been used to support many DOE programs. Nuclear weapons such as the B61, B83, W76, W81, W82, W84, and other DOE programs are utilizing over 20 different custom LSI designs from the present Sandia facility.

The preferred production source for Sandia designs and technologies is American industry, however, industry has experienced difficulties in producing these complex, radiation hardened parts. Since the present Sandia facility was established with emergency production capability, it has been used extensively in recent years to supplement the parts production from industry. To date the Sandia facility has produced several tens of thousands of hardened LSI parts from DOE needs. However, efforts to transfer Sandia technologies are continuing to have been met with success during the last two years. Sandia's radiation hardened CMOS technology has been transferred to Harris Semiconductors, GE, National Semiconductors, and RCA and reviews have been given to virtually all IC companies serving the military market.

The proposed facility is to develop the next generation of radiation hardened VLSI integrated circuits to support DOE nuclear weapon requirements. It is not intended to support the Very High Speed Integrated Circuit [VHSIC] program. The VHSIC and Sandia programs differ importantly in their priorities: In VHSIC, the primary emphasis is on speed and packing density with secondary attention on radiation hardness. In the Sandia program, the priorities are reversed. While speed and packing density are important, principal emphasis must be on radiation harness.

The proposed facility will allow present radiation hardened technologies at Sandia National Laboratories to be improved in density and performance to meet the more complex DOE electronic requirements of the 1990's while maintaining present radiation hardness capabilities.

Although the purpose of our present facilities is to support DOE hardened electronic needs they have also been used to support a variety of DOD programs requiring high-reliability, radiation hardened parts. We are presently supporting the Milstar, AWS, Navstar, and MX programs of the USAF, the SENTRY program of the USA, and the National Security Agency on a cost reimbursement basis. We are also designing and fabricating radiation hardened parts for a number of DOD contractors (>10).

Attached are comments on Sandia's Center for Radiation-Hardened Microelectronics (CRM) by: Robert A. Duffy, President, the Charles Stark Draper Laboratory, Inc. (September 25, 1980). Bruce Murray, Director, Jet Propulsion Laboratory (Septemer 8, 1980). Lt. Gen. Richard C. Henry, USAF, Commanding Officer, Space Division (September 2, 1980). Maj. Gen. John W. Hepfer, USAF, Commander, Ballistic Missile Office (August 18, 1980). Vice Adm. B. Innam, NSA/Chief (August 12, 1980).

It is clear that radiation hardened VLSI devices (approximately one million transistors per chip) will be required in the DOE nuclear weapon systems of the 1990's. Future developments in weapon capability, accuracy, command and control, and safety all require electronic components which cannot be built with present hardened technologies.

The proposed VLSI facility is to allow the Sandia/DOE program of radiation hardened, high reliability, low-power integrated circuits to continue to evolve in density and performance. The present facility does not meet, and cannot be modified to meet, the stringent requirements of vibration, temperature control, or humidity control essential in the fabrication of the very small (submicron) geometries required for the next generation VLSI devices. The new facility has been designed with the capability and capacity to meet these DOE needs of the 1990's. It is our intention to support DOD needs for hardened VLSI devices in that time frame, if required, in a fashion similar to our present support of DOD needs in hardened LSI. This proposed facility has been described to a number of DOD agencies and committees concerned with advanced microelectronics (e.g., JDL (Joint Directors of Laboratories) Committee—C. G. Thornton, Chairman; DOE AGED (Advisory Group on Electron Devices) Master Committee and Subgroup B; VHSIC Office—S. Maynard; USAF (SD, AFWL, RADC); NSA Advisory Board). The proposal has been supported and our efforts encouraged at all presentations. In fact, 33 percent of Sandia's microelectronics budget in fiscal year 1983 of $37 million is derived from Defense and other Federal agencies who have turned to Sandia for integrated circuits as a source of last resort.

THE CHARLES STARK DRAPER LABORATORY, INC.,
Cambridge, Mass., September 25, 1980.

Dr. MORGAN SPARKS,
President, Sandia National Laboratories,
Albuquerque, N. Mex.

DEAR MORGAN: I was very pleased to hear that your Center for Radiation-Hardened Microelectronics appears to have a permanent future. I had long felt that we have sorely needed to exploit your approach and regard it as a significant national asset. Your mode of operation is simply the only way to accommodate the need for new device designs, produced in limited quantity, in the face of the view that the large semiconductor manufacturers take of Department of Defense and other government agency development work.

I wish you and your microelectronic enterprise continued good fortune. Please visit us when you are in our area.

Sincerely yours,

ROBERT A. DUFFY, *President.*

JET PROPULSION LABORATORY,
CALIFORNIA INSTITUTE OF TECHNOLOGY,
Pasadena, Calif., September 8, 1980.

Dr. MORGAN SPARKS,
President, Sandia National Laboratories,
Albuquerque, N. Mex.

DEAR DR. SPARKS: The Sandia Laboratories proposal to create a Center for Radiation-Hardened Microelectronics (CRM) has been received here at the Jet Propulsion Laboratory with widespread interest. As you are well aware, the nature of our missions require electronic component technology that must meet the highest of reliability standards, and that quite often must operate in hostile environments, such as the radiation belts encountered at Jupiter. These requirements have been difficult to satisfy via the commercial vendors that produce the parts that we use. This, of course, will become even more of a problem as we advance from LSI to VLSI.

Our most recent experience with the Galileo mission has been a painful example of the difficulties that we now face and would like to avoid in the future. The cooperation that Sandia Laboratories has given in helping us solve our parts acquisition problem has been outstanding, and I would like to take this opportunity to thank you and your organization for all the assistance you have provided.

Your CRM proposal is especially attractive to JPL for all of the reasons previously mentioned. Although we have not formally discussed the proposal with the other NASA centers, we feel that they, too, would stand to benefit from such an arrangement. Although the foremost problem in our minds at the moment is radiation hardness, I feel in the long run that the greatest benefit to the NASA community will come from their access to a highly reliable source for the design and fabrication of custom LSI.

The long-term arrangement which CRM proposes would necessitate approval by NASA at the agency level. Therefore, we have informally distributed copies of the plan to NASA's associate administrators by way of the Office of Chief Engineer. The unofficial, and informal, response that we have received indicates that there was a recognition that CRM would be useful to NASA, but there was no particular office that was prepared to accept funding responsibility.

Inasmuch as JPL believes very strongly in the approach that you have proposed, we do not intend to allow it to become a dead issue. I would like to propose some specific steps that can be taken to gain NASA support for CRM. These can generally be thought of as being either long term or short term.

First, long term. This involves an institutional commitment by NASA for the continued support of CRM at approximately $2M per year. I propose that CRM be submitted directly to NASA Headquarters as a formal proposal. Prior to, or concurrent with, that submission, JPL would advocate CRM at NASA Headquarters and the other NASA centers. We would ask that Sandi personnel support this advocacy in the form of special presentations, etc. We are hopeful that, with proper exposure, the need for NASA's participation can be firmly established and a mechanism set up for an institutional commitment on NASA's part.

In the short term, I think it is important to continue the cooperative efforts between our laboratories. I refer not only to the Galileo parts acquisition, but also to the development of design aids and product assurance approaches to custom LSI. I am confident that some additional monies, independent of a NASA institutional commitment, can be directed to Sandia during fiscal year 1981 for accomplishing tasks of mutual interest that would be supportive of the CRM concept. Although these tasks have not yet been fully approved, I expect that a minumum of $100K would be available. In addition, it may be reasonable to view some of the current Galileo funds as being appropriate to CRM. I estimate that perhaps as much as $900K might be applicable. Although these monies do not total the $2M requested, it does constitute an interim step that should be helpful in initiating the CRM concept.

In summary, JPL stands ready to support CRM and is reasonably optimistic that some funding support can be obtained in the near future, and hopeful that an institutional commitment can be obtained from NASA. I have asked Dr. Peter Lyman, manager of our Information Systems Division, to act as the point of contact for this effort. If you concur with the steps that I have proposed, please feel free to have your people work directly with Pete.

Once again, JPL feels that CRM is an important step to securing reliable LSI products for government applications. We wish to be of whatever assistance we can in helping to establish that capability. Please feel free to personally contact me for further discussions.

Yours truly,

—— ——

(For Bruce Murray, Director).

Department of the Air Force,
Los Angeles, Calif., September 2, 1980.

Mr. Morgan Sparks.
President, Sandia Laboratories,
Albuquerque, N. Mex.

Dear Mr. Sparks: The Air Force Space Division plans to participate in the Sandia Laboratories program to develop a Center for Radiation-Hardened Microelectronics (CRM). The program is most timely and can be of great benefit in developing radiation hardened technologies for space systems. We are pleased with your efforts to help infuse this vital technology into private industry with emphasis on developing alternate and eventually competitive sources of hardened electronics. It is necessary, however, that the program plan and cost sharing arrangements be more fully definitized before program initiation.

We wish to work closely with Sandia Laboratories in planning your approach for technology transfer to industry. An energetic program is needed on the part of government to assure that industry assimilable technology is developed on a timely basis. Wherever possible, the micro-technology industry should be involved early in Sandia's research and development to preclude specialized or unique processes and instrumentation. In this respect, the Air Force can assist Sandia planners by way of the sophisticated inplace facilities and staffs at RADC and the Avionics Lab.

The question of priorities among participating agencies using the CRM should also be addressed. A composite user program plan which details end item objectives and schedules should be compiled. Additionally, your commitment to provide a sample of Sandia developed items, especially when such items become critical to schedule, delivery, and performance of new space systems, is requested.

The CRM offers Space Division a needed resource for technology development; Sandia Laboratories will have our close cooperation in these efforts. I have designated SD/YI to work details with Sandia staff. Major Hohn A. Criscuolo, (213) 643-0140, will be our focal point.

Sincerely,

Richard C. Henry,
Lt. Gen., USAF, Commander.

Department of the Air Force,
Ballistic Missile Office (AFSC),
Norton Air Force Base, Calif., August 18, 1980.

Dr. Morgan Sparks,
Sandia Laboratories,
Albuquerque, N. Mex.

Dear Dr. Sparks: I strongly indorse your proposal to expand the Sandia National Labs to provide a Center for Radiation Hardened Microelectronics. The strategic missile community has long needed such a guaranteed source of technology and a means for transferring that technology to industry.

Even in view of the scarcity of semi-conductor suppliers both willing and able to satisfy our needs, current MX performance requirements and schedules will be met using existing technologies and suppliers. The picture is less certain, however, for future BMO needs. We need to begin now to establish the technology base for booster, reentry vehicle and C^3 applications for future MX growth options and follow-on systems.

I also agree that there are many details regarding clarification and consolidation of our needs, specific technologies and applications to be pursued, timeliness, and funding arrangements that need to be worked out. In this regard AERES will act as the focal point for BMO. In the next few days Lieutenant Colonel Belmonte will contact your staff to arrange the necessary initial working meetings.

In view of the number of potential clients reflected in your proposal, it will probably take several months before similar arrangements can be made with all prospective CRM clients. At this time when your total commitments are known a final BMO/Sandia agreement can be made.

In the meantime it would be most beneficial for us to gain a firsthand appreciation of your current technologies and capabilities. Specifically, it would be reassuring if, before any final agreements are made, we could conduct tests on selected parts produced both by Sandia and Sandia sponsored suppliers. Again I have asked Lieutenant Colonel Belmonte to work out these details with your staff.

Sincerely,

John W. Hepfer,
Major General, USAF, Commander.

National Security Agency,
Central Security Service,
Fort George G. Meade, Md., August 12, 1980.

Dr. Morgan Sparks,
President, Sandia Laboratories,
Albuquerque, N. Mex.

Dear Dr. Sparks: Thank you for your concern about our needs for high performance radiation-hardened microelectronics. We appreciated Dr. Gregory's presentation in June and his proposal for a Center for Radiation-Hardened Microelectronics.

We are interested in participating, but have a very tight financial situation for fiscal year 1981 and fiscal year 1982. Consequently, we are not yet able to establish our level of commitment.

I have asked Dr. Clinton Brooks, Chief of our Office of COMSEC Technology and Support, R15, (301) 796-6774, to continue discussions with you. Perhaps we can become paying participants.

Sincerely,

B. R. Inman,
Vice Admiral, U.S. Navy, Director, NSA/Chief, CSS.

ANTARES FACILITY

Senator Warner. What is the justification for completing and operating the ANTARES facility?

Mr. Thorn. Operation of the ANTARES facility will provide important data needed to complete the evaluation of the CO_2 laser as a driver for ICF applications in weapons physics and energy production as directed by DOE. The critical experiments will be to confirm at higher energy the target physics scaling laws derived from the last two years of HELIOS experiments, to examine changes that may occur in these scaling laws due to changes in the laser pulse length (pulse shaping was not possible on HELIOS), and to examine changes in scaling laws due to longer plasma gradients that are more representative of full reactor target dimensions. (The ANTARES depth of field if 2mm as opposed to 0.3mm at HELIOS.)

During the last two years, virtually all of the experimental data on target performance obtained by the national ICF program has been obtained by Los Alamos with HELIOS. In preparation for ANTARES experiments, Los Alamos has just completed a review of this work using an external panel of six scientists who are known experts in various aspects of fusion physics. The view of this panel on CO_2 experiments may be summed up with statements by Dr. F. Perkins, Leader of Princeton Plasma Physics Laboratory Theory Division, and Professor H. Griem, University of Maryland, ". . . the committee was greatly impressed by the clarity of completeness of the presentations of HELIOS . . . results. (But) two physics concepts are still not fully understood: magnetic field generation (which may provide insulation from target preheat) and CO_2 absorption in underdense media. The larger depth of focus in ANTARES may lead to rather different results (on hot electron production) than would be expected from HELIOS."

In addition, experiments at ANTARES will provide Los Alamos the opportunity to explore the physics of implosion hydrodynamics. A solution of this problem is of critical importance to both the ICF and weapons programs. Further, ANTARES will be beneficial for investigation of basic processes associated with Weapons Advanced Concepts programs.

Senator **WARNER**. What is the level of power from ANTARES compared with HELIOS?

Mr. **THORN**. HELIOS presently operates at an energy of about 5 kj. ANTARES is expected to operate at an energy of about 30–40 kj. The HELIOS and ANTARES peak power is 10 TW and 60–70 TW, respectively.

Senator **WARNER**. What will the annual operating costs be for ANTARES?

Mr. **THORN**. The annual operating costs of ANTARES, including facilities operations, experiments, experimental data analysis, and target fabrication, are expected to be in the range of $17 million to $20 million.

Senator **WARNER**. When will it (ANTARES) be operational?

Mr. **THORN**. ANTARES will become operational in October 1983.

Senator **WARNER**. What is the program management plan for the operation of the two facilities?

Mr. **THORN**. HELIOS will be deactivated as an eight-beam laser by about July 1, 1983, freeing personnel for activation of ANTARES. HELIOS will continue in an operational readiness state on three of eight beams until ANTARES begins target experiments in October 1983. At that time, HELIOS will discontinue ICF operations. There is no intention to attempt to operate both facilities simultaneously for ICF research.

Senator **WARNER**. How long does the laboratory plan to operate the ANTARES facility?

Mr. **THORN**. The decisive CO_2 experiments mentioned above can be completed in 12 to 18 months. The use of ANTARES for more general experiments on ICF target hydrodynamics and scoping studies of new weapons concepts may extend the useful life of the existing laser to about 3 years. As noted below, the ANTARES building and target area have the capability of accommodating a much larger laser system than presently being completed, and plans for extended use of this building complex with other laser drivers are actively being developed.

Senator **WARNER**. To what alternative uses for the ANTARES operating funds could the laboratory apply these operating funds to further the national ICF mission?

Mr. **THORN**. For the last several years, Los Alamos has maintained the most active target-experiment program in the national ICF effort using both HELIOS [deleted]. We expect to continue this leadership role in target physics experiments with ANTARES. During this time, we have also supported all of the target fabrication needs of the Sandia National Laboratories.

From the experimental data obtained, we recognize that to accomplish the stated goals of the national ICF program will require a driver that can be pulsed several times a second and deliver several megajoules of energy from a range of several meters into a volume of space a few millimeters in diameter. To date, only the CO_2 laser has shown the capability to meet all these driver requirements and for this reason we have vigorously addressed the problem of developing practical targets for the CO_2 laser. We wish that the President's budget contained adequate funds to make full use of ANTARES [deleted] to solve these difficult problems.

For ANTARES, we would initiate the addition of a short wavelength gas laser within the existing ANTARES building for high compression target experiments and a factor of two extension of the range of wavelength scaling experiments that will be performed on NOVA. The existing ANTARES target chamber is capable of containing target yields of up to 1 MJ and the laser building and control systems are capable of accommodating a laser that could be as large as 10 times the energy of the two CO_2 amplifiers presently being completed. In brief, the ANTARES building has the potential for major upgrades in experimental performance without any new construction or changes in structural architecture. Los Alamos certainly plans to capitalize on this inexpensive growth potential and fully utilize the highly skilled 260-man scientific effort assembled over the last 10 years. To this end, as well as to support the needs of the national program for a rep-rateable source of focusable energy, we have developed an experimental test bed for a short wavelength gas laser that can potentially meet all of the ICF driver requirements stated above with costs that are dramatically below existing laser systems. With level-of-effort funding, we believe we can complete this evaluation while continuing to support important ANTARES [deleted] experiments and the projected target needs of SNL. This plan makes optimal use of the very substantial investment in these unique facilities.

Senator **Warner**. Mr. Wade, the Committee understands that the DOE and its contractors face numerous damage claim suits arising out of past atmospheric nuclear testing programs. What is the financial and programmatic impact of these suits against the Government and the contractors which were carrying out the Government's nuclear testing programs?

Mr. **Wade**. 5,200 claimants are involved to date, seeking about $5 billion in damages, plus $4 billion in punitive damages from our contractors. Of course, such an onslaught is unprecedented so estimates are hard to be certain about, but as of now I would estimate that up to several million will be needed annually, at least over the next decade, for the proper defense of the Government and the contractors. Aside from this substantial incremental funding requirement, the impact on our contractors—particularly if the Government does not assume the role of the real party in interest in these lawsuits—can be very detrimental to the continued effective conduct of our nuclear weapons program.

Senator **Warner**. These numbers are truly alarming. As far as the contractors are concerned, weren't they just performing the testing work for the Government, under the Government's control? Are we doing everything possible to see to it that the Government takes direct charge of the litigation, as the real party in interest, and that the contractors are not left out on a limb?

Mr. **Wade**. This matter has been the subject of intense discussions within the Executive Branch for several months. Important legal and policy issues hang on resolution of the appropriate defenses to be asserted in the cases and how they are asserted. This matter is being addressed at the highest levels of the Departments of Justice and Energy with personal involvement by the Secretary and the Acting Attorney General.

Senator **Warner**. Last year, the Supreme Court upheld New Mexico State gross receipt tax as imposed on DOE's contractors, notwithstanding that the bill would have to be paid by the Government. I understand the Department and the State have been developing a payment schedule. What financial impact will this have on DOE Operations?

Mr. **Wade**. We have tentatively agreed to pay New Mexico $274,913,000. Our estimate of the annual tax impact in upcoming years is about $28 to $35 million. Of course, other States may follow suit, imposing additional tax burdens on our program. (We in DOE still believe that the operator-managers of our laboratories, who have been operating for many years under special management-type arrangements rather uniquely utilized by the DOE and its predecessor agencies—as distinguished from GOCO contractors employed by DOD and other federal agencies—should not be subject to such State taxes. However, the Supreme Court has now made it clear that it would take Congressional action to effect such exemption.)

Questions Submitted by Senator Strom Thurmond

SAVANNAH RIVER PLANT

Senator **Thurmond**. What is the status of the L Reactor restart?

Mr. **Wade**. The L Reactor upgrade project was initiated in 1981 to support a potential October 1983 restart. The upgrade activities are currently on schedule to support an October 1983 restart with design 97 percent complete, procurement 95 percent complete, and construction 81 percent complete. The initial delivery of fuel to the reactor and introduction of heavy water into the reactor coolant system will take place on April 20, 1983. Checkout and turnover of each major system are proceeding and various component and system pre-operational tests are being carried out.

Senator **Thurmond**. When will public hearings begin?

Mr. **Wade**. The Federal Register notice initiating the extended review process was published April 18, 1983. The public hearings to be conducted as part of this process are scheduled as follows: Augusta, Georgia, May 23, 1983; Aiken, South Carolina, May 24, 1983; Savannah, Georgia, May 26, 1983; and Beaufort, South Carolina, May 27, 1983.

Senator **Thurmond**. What will be the result if a significant delay in restart of the L Reactor occurs?

Mr. **Wade**. A 6-month delay in the startup of L Reactor would result in a loss [deleted] of weapon-grade plutonium which is needed [deleted].

Senator **Thurmond**. Is DOE prepared to ask the President for a special exemption to allow restart of the reactor?

Mr. **Wade**. The presidential exemption applicable to the L Reactor concerns Federal compliance with pollution control standards (Executive Order 12088) including the Federal Water Pollution Control Act. Currently, the Department is in the process of negotiating the National Pollutant Discharge Elimination System [NPDES] permit effluent limitations with the South Carolina Department of Health and Environmental Control [SCDHEC] which will be applicable to L Reactor as well as the other production reactors. We are currently proceeding on the basis that a satisfactory resolution of the NPDES permit will be reached with SCDHEC.

If satisfactory resolution of the permit cannot be reached in a time frame to support restart of the L Reactor as required by the presidentially approved Nuclear Weapons Stockpile Memorandum, the Department will consider the feasibility of other alternatives to allow timely restart of the reactor.

Senator **Thurmond**. Regarding budgetary requirements for the Savannah River Plant, I understand that five projects are to be funded at levels below that requested by the Site. Of these, four deal with reactor safety (Project 82-D-126), safeguards (Project 82-D-127), and non-radioactive waste management (Project 82-D-147) and Project 83-D-148). In light of heightened public concern over issues of reactor safety and safeguards as well as environmental pollution, would it not be better for DOE to restore funding to these projects and proceed at a faster pace?

Mr. **Wade**. As you are aware, the President is committed to the task of reducing budget deficits. In line with this goal it was not possible to meet all site requests. Each request was conscientiously examined to identify any items that were not absolutely essential. In the case of the Safeguards Improvements Project (82-D-127) the amount being requested by the Savannah River Plant was determined to be necessary and the full amount was included in the Budget before you.

Conversely, based on the projected status of Projects 83-D-147 and 83-D-148 going into fiscal year 1984, it was considered unlikely that the two projects would be in a position to utilize the total amount of funding being sought. An appropriate reduction was, therefore, made in the request.

Project 82-D-126 (Reactor Safety and Reliability) could proceed at a faster rate than will be allowed by the funding level listed in the President's Budget but, additional budget authority would be needed in fiscal year 1983 to achieve this acceleration. We are currently looking at the possibilities of submitting a fiscal year 1983 reprogramming action for this project that would cover both fiscal year 1983 and 1984 requirements.

Senator **Thurmond**. Regarding Project 82-D-201, Special Plutonium Recovery, I understand that if $5 million can be added to the fiscal year 1984 funding, a savings of $1.8 million on the total cost and a reduction in completion time of 6 months could be realized. Since this facility would increase plutonium production in the most efficient manner, why has DOE decided to stretch out the funding?

Mr. **Wade**. Five million dollars was cut from the Department's fiscal year 1983 funding request for Project 82-D-201 by the Senate Appropriations Committee. This reduction extended the project by 6 months and increased the total estimated cost by the $1.8 million that you are referencing. The President's fiscal year 1984 budget was already fixed at the time the fiscal year 1983 cut occurred; therefore, a follow-up adjustment could not be made in that year's funding.

Senator **Thurmond**. What is the status of a decision to build a New Production Reactor (NPR)? Where is it to be sited?

Mr. **Wade**. On July 7, 1982, a blue ribbon panel of six experts was selected to review the candidate reactor concepts and sites for the NPR. In its report to DOE on November 15, 1982, the panel recommended that a Zero Electric Power Heavy Water Reactor be constructed at Savannah River. If byproduct steam is required, then the panel recommended that a Low Temperature Heavy Water Reactor at Savannah River or a Replacement N Reactor at Hanford be constructed. The panel's recommendations are advisory in nature. Secretary Hodel is reviewing these recommendations as well as other input and expects to make a decision in early summer.

Senator THURMOND. What is the current situation at the Savannah River site concerning safeguards and security?

Mr. WADE. The security program at the Savannah River site is currently under review. [Deleted.]

Senator THURMOND. If the contractor, DuPont, no longer provides for security guards, who will?

Mr. WADE. Since it is inconsistent with DuPont's corporate policy to employ an offensive response force, DOE will separate the guard force function from the operating contract. The Savannah River Operations Office is now proceeding with a Request For Proposal for a new guard force contractor which will report directly to the DOE.

Senator THURMOND. How will that affect security at the site?

Mr. WADE. This new force will serve to strengthen the security position at Savannah River.

Senator THURMOND. What is the status of a decision to build a Special Isotope Separation [SIS] facility? Where is it to be sited?

Mr. WADE. The decision on process and site for an SIS production facility is being carefully considered by the Secretary of Energy. The candidate processes are the Atomic Vapor Laser Isotope Separation [AVLIS] process being developed at LLNL and the Molecular Laser Isotope Separation [MLIS] process being developed at LANL. One of these processes will be selected as the basis for an SIS production facility to be located either at the Hanford or the Savannah River site. It is anticipated that this decision, including the process to be used and the production location, will be reached soon so that a substantial part of the fiscal year 1983 funding can be applied toward this objective.

Given the importance of this technology to meeting our materials production requirements, the particular advantages of each process being considered, and the remaining technical uncertainties with both processes, the Department of Energy also intends to continue work on the alternate technology at least through the prototype demonstration stage. This is necessary to provide high assurance of attaining the required material production from Special Isotope Separation.

Senator THURMOND. What can be done and is being done to reduce tritium releases at the Savannah River site?

Mr. WADE. At the Savannah River Plant [SRP], there are two sources of tritium releases: the heavy-water moderated reactors, and the tritium processing facility. In the heavy water-moderated reactors, tritium is produced primarily by neutron activation of deuterium. Every effort is made to recover tritium-contaminated heavy water which might otherwise enter the reactor effluent streams. Several projects have been undertaken to reduce tritium releases. First, a continuous leak control program was initiated to minimize leaks in the heavy water piping system. Next, a heat exchanger rejuvenation program was implemented to minimize heavy water leakage from the reactor heat exchangers to the secondary coolant and the facility drains. Projects to improve flushing capabilities on the machines used for discharging irradiated fuel and targets from the reactor have been completed. Finally, DOE is developing a technology which could be used to remove tritium from the heavy water moderator. While this technology has been demonstrated on a laboratory scale, large scale operation is still in the research and development stage.

To prevent accidental atmospheric releases of large quantities of tritium from the tritium processing facility, trapping systems have been installed. These systems are in operation and working well. We are currently replacing certain high maintenance equipment to reduce releases of tritium as a result of maintenance activities. In addition, an ongoing program is underway to locate and correct sources of minor losses of tritium and, finally, we are continually looking for means of further reducing atmospheric releases.

Senator THURMOND. What is the current situation concerning groundwater contamination with non-radioactive substances at the Savannah River site? What can and is being done to mitigate the problem?

Mr. WADE. Your specific concern about the issue of potential groundwater contamination is being very actively addressed on a total site basis. Although very low levels of chlorinated hydrocarbons were recently reported in wells drawing from the Tuscaloosa aquifier on the Savannah River Plant site, no contamination of offsite groundwater has occurred. The Savannah River Plant has monitored the quality of groundwater extensively for many years and instituted projects to reduce the discharges to the seepage basins and demonstrate the cleanup of onsite groundwater. A comprehensive hydrogeologic investigation of the Savannah River Plant is being conducted, and the information is being used as the basis for decisions concerning onsite groundwater management. We initiated work on projects in fiscal year 1983 totaling over $22 million aimed at preventing offsite contamination of groundwater. The Savannah River Plant personnel have been working for some time with the South Carolina Department of Health and Environmental Control to ensure that all standards concerning groundwater will be met.

These actions, which are already underway, will ensure that the Savannah River Plant does not pose either an imminent or long-term threat to the groundwater or the quality of drinking water for the surrounding communities.

BARNWELL NUCLEAR FUEL PLANT

Senator **Thurmond**. It now appears that the owners of the Barnwell Nuclear Fuel Plant would be willing to donate this facility to the Federal government.

The land on which Barnwell was built was originally part of the Savannah River complex. It has been suggested that the Barnwell facility now be incorporated into Savannah River and reserved for national security purposes.

If Barnwell were donated to the Federal government, and the facility was not to be used for commercial reprocessing, what national security purposes could be served by preserving the facility?

Mr. **Wade**. I know of no national security purposes that could be served by preserving the Barnwell Nuclear Fuel Plant.

Senator **Thurmond**. It has been suggested that Barnwell could be used for the reprocessing of defense fuels; in particular, the Hanford N Reactor fuel. Would it be prudent to do this? Would costly additions to DOE facilities be unnecessary if this course were followed?

Mr. **Wade**. It would not be prudent to process fuel from the Hanford N Reactor in the Barnwell Nuclear Fuel Plant [BNFP]. The plutonium in the N Reactor fuel is needed to meet defense programs requirements beginning in fiscal year 1984, and the PUREX facility at Hanford is being reactivated to process this fuel. PUREX operation is scheduled to begin during the first half of fiscal year 1984.

Providing capability for converting the BNFP product (plutonium nitrate solution) to oxide, and for treatment of liquid radioactive waste would preclude processing N Reactor fuel in the BNFP until the late 1980's. Other considerations such as shipment of the spent fuel from Hanford to Barnwell, and cost of providing the oxide conversion and waste treatment capabilities dictate that the prudent course of action is processing of the N Reactor fuel in PUREX at Hanford. There are no required or planned additions to any DOE facilities which could be obviated by processing N Reactor fuel in the BNFP.

Senator **Thurmond**. If there is no immediate need to use Barnwell to reprocess defense fuels, would it make sense to mothball Barnwell as a reserve reprocessing facility for future national security use?

Mr. **Wade**. With existing fuel processing facilities for defense programs at Hanford, Savannah River, and Idaho, there is no foreseeable need for any processing facilities at the BNFP. It would make no sense to mothball Barnwell as a reserve reprocessing facility for future national security use.

Senator **Thurmond**. Is there any other national security purpose, such as R&D work or spent fuel storage, for which Barnwell might be utilized?

Mr. **Wade**. There is no other foreseeable national security purpose, including R&D work and spent fuel storage, for which the BNFP might be utilized.

Questions Submitted by Senator Carl Levin

INERTIAL CONFINEMENT FUSION

Senator **Levin**. I note that the budget request for Inertial Confinement Fusion has dropped from $190 million in the fiscal year 1983 Appropriation to approximately $152 million for next year. Although reduced construction costs contribute to this drop, I am concerned that the request for operating expenses is set at $127 million, which is $13 million less than the operating budget for fiscal year 1983.

Our investment in the ICF program is extensive. The NOVA laser facility at the Lawrence Livermore National Laboratory is nearing completion, and the funding for this facility alone has amounted to some $180 million. Now that we are about to reap the scientific rewards of this project, we must be sure that we adequately fund the basic experiments for NOVA to function in a timely fashion upon completion. For us now to shortchange the program on the basic physics data needed for NOVA would be a mistake, particularly when the required funding is small in comparison to our overall investment.

What is the rationale for the reduction in operating expenses (about 14 percent in real terms) for the ICF program for fiscal year 1984? What would the effect of this reduction be on the ICF program, particularly for the support activities for the NOVA glass laser project?

Mr. **Wade.** The fiscal year 1984 operating level for the Inertial Confinement Fusion program must be viewed in the context of the overall government-wide requirements. This program is competing with some programs which are considered to have a higher priority in a stringent budgetary environment. The requested level will permit us to continue an adequate program directed toward demonstrating the feasibility of inertial confinement fusion using lasers or particle beams.

Senator **Levin.** The support laboratories (KMS Fusion, Inc., University of Rochester, and Naval Research Laboratory) for the ICF program are on the critical path of the NOVA experiments by providing necessary target physics data and target fabrication technology. It is my hope that the continued role for the support laboratories will be long term in order to realize the full potential of ICF as an energy source.

What are your plans in this regard? How are the energy aspects of ICF currently being addressed in the program? What basic technologies are being developed in this regard?

Mr. **Wade.** The present ICF program plan provides for the continuation of the fiscal year 1984 level of effort in the major participating laboratories through fiscal year 1987, at which time a comprehensive program evaluation of ICF will be made. The integration of the major support laboratories with the glass laser experiments effort at Livermore has been successful and is working well. We intend to continue this working relationship through the period of NOVA target experiments and expect it will contribute significantly toward the success of the NOVA experiments.

Most aspects of the current program contribute to both weapons and energy goals. The plans with regards to the energy goal which is the long-term programmatic goal are contingent upon the fiscal year 1987 comprehensive program evaluation.

Senator **Levin.** Please identify for the record which items in the budget contain funds for research, development, testing, or production of neutron weapons. What are the funding levels and how will this money be spent?

Mr. **Wade.** [Deleted.]

Research, development, and production on the W70-3 LANCE has been completed. The fiscal year 1984 production and surveillance budget includes $1.2 million to carry out necessary stockpile maintenance and reliability activities; of this amount, $1.1 million will be expended in fiscal year 1984.

About [deleted] is included to continue the production of the W79 8-inch artillery fired atomic projectile. Full-scale production on this system began in 1981. About [deleted] will be expended in fiscal year 1984. [Deleted.]

Questions Submitted by Senator Jeff Bingaman

NUCLEAR EXPLOSION VERIFICATION TECHNOLOGY

Senator **Bingaman.** What is the role of technology base research in DOE/ISA's program to develop monitoring and verification systems and techniques?

Mr. **Wade.** The role of technology base research is to provide the technological foundation upon which to build new or improved instruments, systems, or techniques. It forms the bridge between basic research and applications of new technology and is essential to the development and deployment of improved methods for monitoring the activities of other nations related to the development, testing, deployment, or use of nuclear weapons. Monitoring in turn contributes to treaty verification, arms control, and other aspects of national security (e.g., military intelligence).

DOE/ISA's responsibilities in the development of monitoring and verification systems and techniques include the following:

(1) Development and fabrication of satellite-based instruments for the Detection, [deleted] of nuclear explosions in the atmosphere or in space, to monitor compliance with the Limited Test Ban Treaty [LTBT] and the Non-Proliferation Treaty [NPT].

(2) Development of satellite-based and other instruments and of analytical methods [deleted] for other nuclear intelligence support activities.

(3) Development of instruments, systems, and analytical methods for the [deleted] of seismic events emphasizing local and regional measurements (out to about 2000 km), made by in-country seismic networks comprised of such stations and/or arrays to monitor compliance with the Peaceful Nuclear Explosions Treaty (PNET), a Comprehensive Test Ban Treaty [CTBT], or a modified Threshold Test Ban Treaty [TTBT].

(4) Development, deployment, and operation of systems and techniques for onsite inspections in support of a PNET, CTBT, or modified TTBT as well as other treaties (e.g., START/INF).

Senator **Bingaman**. How adequate is the support for technology base research in looking to monitoring and verification requirements of the future?

Mr. **Wade**. Adequacy of support is always a matter of judgment based upon urgency of requirements, relative priorities and prospects of success. We strive to maintain an appropriate and timely balance among these judgmental elements. Although the DOE Laboratories maintain broad scientific resources and expertise, as well as capabilities to fulfill the short-term needs of our programs, our support for technology base research has been affected because of increasing commitments to existing production programs coupled to the pressing economic realities of escalating costs.

Senator **Bingaman**. Is the level of support in all programs of monitoring and verification technology research sufficient to yield timely results?

Mr. **Wade**. Timeliness is necessarily as difficult to predict as the rate of progress of arms control negotiations. Prudence requires that we be prepared to the best of our ability for the earliest credible time schedule, and that at the same time we be alert to changing priorities called for by changes in negotiating initiatives. The latter in turn are influenced by our contributions to the negotiating process. One of our responsibilities is to provide support to the negotiations in the form of technological options and nuclear weapons intelligence. Another responsibility is to provide a capability to reply to possible challenges from the other side that we have not observed a treaty obligation.

We believe that we are providing a level of support for all of our programs of monitoring and verification technology research adequate to yield results that are supportive of U.S. arms control negotiations. We are carrying out technology base research in many areas, with a view toward being able to rapidly accelerate, as needed, the direct support of operational verification requirements. It is assumed that the required resources for appropriate program acceleration will be made available when they are needed. Based upon the expertise of the National Laboratories, we also provide technological support for the DOD's atmospheric and other sampling programs.

Senator **Bingaman**. What are the new emerging areas of technology that should be addressed now in order to be available to meet the monitoring and verification requirements of the future?

Mr. **Wade**. There are a number of emerging areas of technology that are now or soon will be addressed to meet the monitoring and verification requirements of the future, to the best of our ability to anticipate such needs. The relative emphasis among the various base research activities will be determined by a number of key factors including available budget, urgency of requirements as dictated by the climate and pace of arms control negotiations, technical status of the program and likelihood of success, relative technical maturity level among various efforts, etc.

Examples of emerging technologies or analytical capabilities, and of their application, include the following:

(1) Methods for monitoring the manufacture, transportation, stockpiling, and retirement of nuclear warheads in support of START/INF negotiations.

(2) The characterization of regional seismic phases (those not observed at teleseismic distances), and their application to the detection, analysis, and identification of low-magnitude seismic events from small earthquakes or from small or decoupled explosions.

(3) The effects of major regional geologic or physiographic boundaries upon the propagation of the regional seismic waves that travel through the earth's crust and upper mantle.

(4) Site selection criteria and design parameters for local arrays of seismometers and their use to enhance the performance of regional seismic networks (in cooperation with DOD)

(5) The verification of the capabilities of regional seismic networks.

(6) [Deleted.]

(7) [Deleted.]

(8) [Deleted.]

(9) Methods for the detection and discrimination of underground bomb tests based upon propagation of infrasound in the atmosphere, or upon disturbances generated in the ionosphere by shock waves.

(10) Artificial intelligence algorithms to exploit synergism of various detection and measurement techniques.

Senator BINGAMAN. Are there new initiatives with future verification capabilities which you are unable to explore at this time because of resource constraints?

Mr. WADE. There are a number of new initiatives that we are not yet exploring for various reasons. For each new initiative, we establish a view of priority based on timeliness, appropriateness, and availability of resources. In some instances, the reason for lower priority may be that operational deployment is proposed for a system for which an adequate technology does not yet exist. In others, the proposal may be for a system or analytical method for which there is no identified national requirement assigned to DOE—i.e., for which there is as yet no "customer". Overall, we currently have more valuable concepts to explore than we have resources.

Senator WARNER. The subcommittee is adjourned.

[Whereupon, at 3:30 p.m., the subcommittee adjourned, subject to call of the Chair.]

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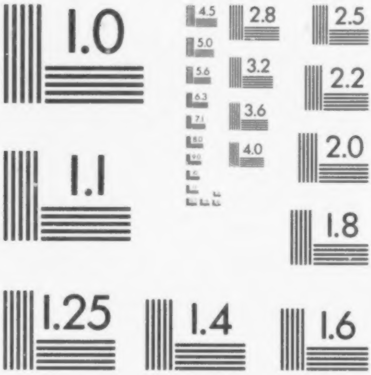
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